SCIENTIFIC AMERICAN

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Explosives from Coal Tar.

That coal tar is susceptible of becoming a very deadly explosive in combination with certain acids was proved two years ago by Herr Hellhof, of Berlin, who at this time patented a process for making fulminating compounds from crude coal tar oils by direct nitration with strong nitric acid. Continued experiments in manufacture by the aid of steam have shown that the separate fractions of these oils, even those having the highest boiling point, are capable of nitration, and give a satisfactory yield of nitro-derivatives. So marked is this property, that the treatment of coal tar itself with strong nitric acid is a very dangerous operation, and could not be carried on largely without great difficulty and loss. In later experiments, therefore, a weaker acid is employed to cover the surface of the tar to be treated, the two being gradually stirred together. The pasty mass thus obtained is washed with excess of water, and the acid remaining in its pores is pressed out. The purified product is then mixed with certain oxygen yielding compounds, such as chlorate of potash, the alkaline nitrates, etc. All of these mixtures give new explosive compounds of different degrees of violence. The power of a concentrated nitric acid solution of one of these new nitro-derivatives is shown by the fact that a small quantity, when exploded by a percussion fuse, was able to shatter an iron shell. The great advantages of the new process for obtaining explosives from coal tar, by the direct use of weak nitric acid, are the cheapness of the raw material and of the light acid employed, and also the quiet and regular manner in which the operation of reduction is performed. Explosive nitro-compounds may also be made from the paraffins and similar mineral and wood oils and spirits. The *Deutsche Industrie Zeitung* observes that this branch of production is the more important since the value of tar may be expected to rise with every fresh use that is found for it.

IMPROVED FLOATING ELEVATOR.

We give engravings of a novel arrangement of floating elevator for grain, coal, etc., constructed by James Rigg, of Chester, Eng., who has for some years past devoted considerable attention to the design and construction of appliances for the mechanical handling of coal. The objects attained by this apparatus are the more rapid and economical transfer of certain classes of materials from barges to steamers or to a quay side than has been hitherto possible by cranes or manual labor.

For sectional details of construction, see page 354

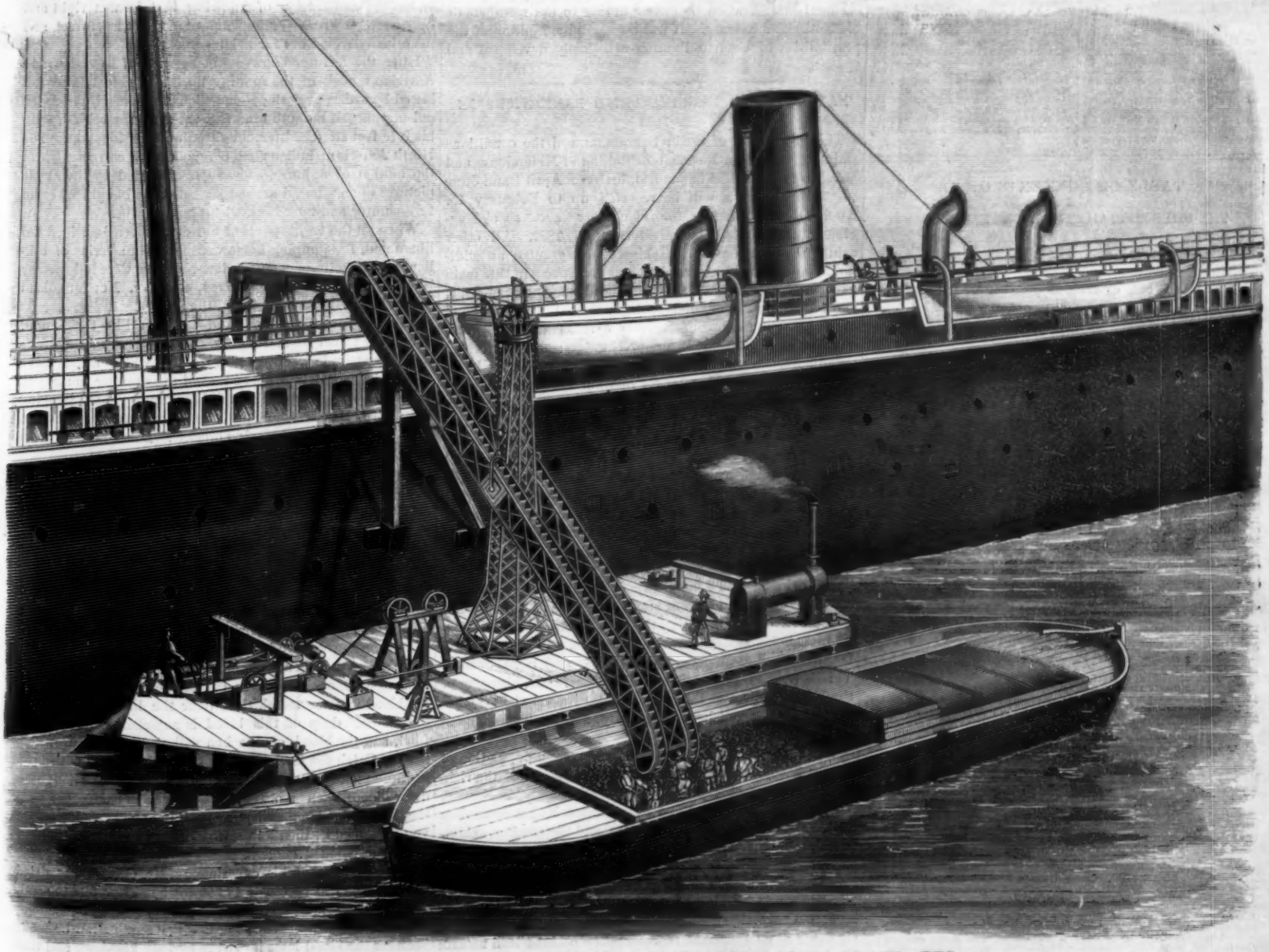
The perspective view represents the elevator as used in the coaling of steamers, but it is equally applicable to the loading under similar circumstances of salt, grain, and other matter. The necessity for some improvement on the present most general method of coaling steamers by hand has long been acknowledged, the system, if it may be so termed, being to place gangs of men in the barges, and others above them upon suspended platforms against the ship's side in sufficient numbers to enable them, by passing the baskets containing the coal from one gang to the next, ultimately to reach the ship's bunker. The expense and inconvenience attending such operations are considerable, and, moreover, are not under such ready control as steam or other power.

It is essential that any apparatus intended for this purpose should be so arranged as to be easily removable from place to place, and to meet this requirement the elevator now under notice is capable of being stowed away fore and aft of the pontoons upon which it is carried, as shown in Figs. 2, 3, and 4, page 354, thus avoiding any risk due to instability. The perspective view illustrates it in operation athwart and coaling a large ocean mail steamer through side bunkers, and the various movements effecting this change are so arranged as to be performed by steam power.

The six pontoons are 6 ft. in diameter by 20 ft. long, independently of their conical ends, and on the saddles riveted upon these are placed rolled wrought-iron beams, carrying the deck. A semi-portable boiler, F, provides steam for the pair of winding engines, which are used for three purposes, viz.: First, for driving the endless steel wire rope which actuates the two chains of elevator buckets or scoops; secondly, for raising and lowering the elevator arms; and, thirdly, for revolving them, that they may be stowed away fore and aft as shown in Figs. 2, 3, and 4. The hollow lattice tower, A, carries at its head a circular roller path, upon which a casting, B, is capable of revolving through the quadrant traversed between the two positions, and below this casting is attached a cast-iron column in three parts, within which pass the driving and return lengths of an endless steel rope; this rope being driven by the V-pulley on the first motion shaft, passes over and under the six grooved pulleys, Figs. 2 and 3, and a balance weight passes through the deck between guides, always maintaining the rope taut.

On the first motion shaft at the head of the elevator is a clip pulley driven by this rope, and a pinion upon this shaft is geared into a spur-wheel upon the drum shaft, thus giving motion to the double continuous chains of scoops (Fig. 9); and these scoops, which are of steel, are connected through malleable iron links to round steel spindles (Fig. 8), upon either end of which are small flanged pulleys traveling in double-angle steel guides forming part of the main suspended frames. The lower ends of these frames being concave, they will dip through the batchways as deeply as the holds of the lighters or barges. Inasmuch as buckets cannot be so constructed as to pick up the coal, this is done by manual labor, and the buckets are formed as trays or scoops (Fig. 9), their capacity being about double that which can be

(*Continued on page 354.*)



IMPROVED FLOATING ELEVATOR FOR LOADING COAL, GRAIN, ETC.

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NEW YORK, SATURDAY, DECEMBER 2, 1882.

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(Illustrated articles are marked with an asterisk.)

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THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 361,

For the Week ending December 2, 1882.

Price 10 cents. For sale by all newsdealers.

HENRY DRAPER.

Professor Henry Draper, M.D., LL.D., died, after a brief illness, at his residence in this city, November 20. Although Professor Draper's scientific labors have been many and of great value, he was yet comparatively young, and there was every reason to anticipate for him great and brilliant successes in riper life. He had inherited much of his illustrious father's ability and love for scientific investigation, and was able to carry on his chosen work under the most favorable of material conditions.

He was born in Virginia, in 1837, and was removed to this city three years later, when his father, Professor John W. Draper, accepted the chair of Chemistry in the University of the city of New York. He was graduated in the Medical Department of the University in 1858, and after spending some months in scientific observations and travel in Europe, he joined the medical staff of Bellevue Hospital. In 1860 he was elected to the chair of Physiology in the Academic Department of the University, which position he filled until last winter, when he succeeded his father in the chair of Chemistry.

While yet in school, he began to develop the possibilities of microphotography, and discovered the value of the proto chloride of palladium in darkening collodion negatives. On his return from Europe he constructed a 15½-inch reflecting telescope, devising important improvements in methods of grinding, polishing, and testing reflectors. With this telescope he carried on the pioneer work of lunar photography. He subsequently constructed the telescope of 28-inch aperture, which he put to such successful use in photographing the spectra of stars. His beautiful diffraction spectrum, obtained in 1872, remains unexcelled. His admirable work as superintendent of the photographic department of the commission created in 1874 to observe the transit of Venus, was rewarded by a special gold medal, struck in his honor by order of Congress.

Among the later achievements of Professor Draper in the department of spectro-photography, are those leading to the discovery of oxygen in the sun, in 1877, and his studies of the great comet of 1881. Meantime he had added to his list of brilliant successes in celestial photography by photographing the great nebula in Orion.

His observatory at Hastings on the Hudson, and his laboratory in this city, are accounted the best equipped private scientific establishments in the country if not in the world. A fortunate marriage early placed at his command almost unbounded facilities for gratifying his taste for difficult and costly investigations, and the world has reaped the benefit.

Professor Draper's social relations were wide and exceedingly happy. A characteristic illustration of his method in social entertainment was shown on the evening preceding his fatal attack, when he gave a dinner to the members of the National Academy. It was a splendid exhibition of the possibilities of electric lighting artistically developed and applied.

NATIONAL AND INTERNATIONAL EXHIBITIONS IN 1883.

The government of Spain has announced the conditions and regulations of a National Exhibition of Mineralogy and Metallurgy to be held in Madrid, between April 1 and June 30, 1883. Exhibits will be received up to February 15. Applications for space for machinery and special exhibits must be made before October 31, 1882. All other exhibitors, save those of machinery, are granted an additional month for filing applications for space in the main gallery. The exhibition is to include all machinery, utensils, and tools (Spanish or foreign) that are used in mining and metallurgy, in the manufacture of earthen and glass ware, and in the utilization of mineral waters; also all foreign manufactures from Spanish minerals. There is to be no charge for space, and water for hydraulic and steam engines will also be free for machines not exceeding five horse power. Liberal arrangements have been made for transporting and handling exhibits, and for the passage of goods in bond through the custom houses for exhibition purposes.

The increasing value of the markets of Spain and her colonies gives to this exhibition especial interest to a large class of American inventors and manufacturers. As an efficient though indirect mode of reacting on Spanish America, the exhibition may be worth considering.

The general agent for the United States for the international, colonial, and general export exhibition to be held in Amsterdam, Holland, from May 1 to October 31, 1883, has issued a circular, presenting the inducements which the exhibition holds out to American farmers, merchants, manufacturers, railway companies, and land and mine owners. This is the first international exhibition in the kingdom of the Netherlands, and is expected to draw many visitors from northern France, Belgium, Germany, and the Scandinavian countries.

The kingdom, with its colonies, embraces a population of nearly 40,000,000 people, and Amsterdam is one of the richest as well as most progressive commercial centers in Europe. Our trade with Holland and its dependencies has more than trebled during the past seven years, and the coming exhibition should be taken advantage of to greatly extend that trade.

At a meeting of bankers and merchants, held in this city November 21, the general agent, Mr. S. A. Wheelwright, reported favorable indications of State and national interest in favor of an abundant representation of American natural and artificial products at this exhibition.

Venezuela proposes to celebrate the centenary of the birth of Simon Bolivar, the South American liberator, by opening a national exhibition at Caracas, July 24, 1883. The Venezuelan Chargé d'Affaires in this city announces that he is authorized to extend a welcome to all authors, inventors, manufacturers, and artisans who may wish to make their productions known in Venezuela. He adds:

"Considering that Venezuela exports $6,000,000 every year to the United States and only imports some $2,000,000 from them, it will be readily perceived that the commerce of this enterprising nation with our country is far behind what is due to its gigantic production and inventive genius; or, in other words, that there is a market in South America for the products of this country not sought for by its commerce to the extent that it might advantageously do so. The exposition at Caracas offers a favorable opportunity to all who may desire to obtain a new and profitable outlet for their goods."

ROMANCE AND REALITY OF ANIMAL MOTION.

Mr. E. Muybridge, whose success in catching and fixing by instantaneous photography the attitudes of animals in motion is so well known to our readers, gave an illustrated lecture upon the romance and reality of animal motion in this city, November 16. By means of a zoopraxiscope the instantaneous views were thrown upon a screen singly, in rapid succession, and in combinations, giving startlingly life like representations of the postures and movements of live animals.

Though the principal attention was given to the horse, the motions of other animals and men were also reproduced and described. After explaining the method by which series of instantaneous views of moving animals were obtained, Mr. Muybridge showed how greatly the reality of animal positions varied from the positions represented in sculpture and painting. Photographs of famous sculptures and paintings were thrown upon the screen, and the impossible attitudes represented were contrasted with views of live horses under the conditions which the artists intended to represent. When describing the walking motion of a horse, Egyptian, Assyrian, and Roman pictures were shown to demonstrate that an erroneous idea of this motion prevailed in the earliest attempts at art. It was perpetuated in the famous statue of Marcus Aurelius, which has been the model of almost all equestrian statues to the present day, and is as conspicuous in the equestrian statues of Washington in Boston and in Union Square as in any of the old Egyptian or Assyrian pictures. It is not possible for a horse to walk in the way there depicted. Meissonier had a correct idea of a horse's walk when he painted his great picture of Napoleon in 1814, but the critics ridiculed it and pronounced it incorrect. Now he has the satisfaction of knowing that he was right and they were all wrong. Miss Thompson also was correct, and the critics derided her for being so.

Later the lecturer showed photographs of Egyptian and Assyrian models of the running horse—models blindly followed by artists ever since—in which the animal is presented poising himself on both hind feet extended far behind, with his fore feet stretched far out ahead of him together. The North American Indians had a much more correct idea of the motion of a horse, as was demonstrated by their rude pictures upon a buffalo robe that Lafayette bought when in this country and took back with him to Paris.

When all the varied paces of horses had been described and illustrated, the jumping horse was shown in a series of brilliant and sometimes comical views. These were followed by illustrations of the gaits of oxen, a bull, a Newfoundland dog, a hound, deer, a goat, and the hog.

The goat runs like a horse and the deer like the hound, bounding rather than running. In one part of the deer's stride its attitude was very near to that which artists have so long inaccurately made as that of the running horse.

Views were given of the walking, running, and jumping attitudes of Hazael, whose unrivaled ungracefulness proved a surprise even to the champion himself. Other athletes were shown boxing and tumbling.

The lecture closed with a beautiful series of pictures of pigeons and sea-gulls in flight. But two peoples—the Egyptians and the Japanese—ever represented birds as seen in some of the photographs with the wings down.

"Vaccination" for Chicken Cholera.

Mr. W. H. Griffith, of Zanesville, O., says that during the past two years he has vaccinated 2,000 fowls in yards badly smitten with chicken cholera, and of this number only 11 died. Of fowls in the same yards not vaccinated all died. The proper procedure in such cases is as follows:

"Vaccinate a hen, and in eight days her system will be thoroughly inoculated; then cut off her head and catch all the blood in some vessel, then pour the blood on paper to dry; a half drop of this blood is sufficient to vaccinate a fowl, and the blood of one hen will vaccinate your whole flock. Catch the fowl you wish to vaccinate, and with a pin or knife make a little scratch on the thigh (just enough to draw blood), then moisten a little piece of the paper with the dried blood on and stick it on the chicken's leg where you scratched it, then let the fowl run, and you need have no fear of chicken cholera."

In the course of his experiments Mr. Griffith has dried enough blood to vaccinate 10,000 fowls. He offers to send, free of charge, to such as wish to try the cure, enough blood to start with. All he asks is that application be made soon (as the blood loses its virtue by long keeping), and that experimenters report results.

History and Cost of a Tunnel.

The recent opening of the St. Gothard Railway through the Alps has moved Consul Byers, of Zurich, to write a sketch of the great tunnel. The pass of that name is over the highest mountain chain in Europe. The New York *Times* condenses from Mr. Byers' article the following interesting facts:

The old post road, commenced in 1820, 7,000 feet above the sea in places, was 18½ feet wide; it crossed gorges, clung dizzily to steep mountain sides, and was roofed over where most threatened by avalanches. When the first railway was opened, in 1846, from Baden to Zurich, it was proposed to ask concessions to enable the company to attack one of the high passes, and in 1863 a union or society for the purpose was effected, upon the basis of an estimated cost of $37,400,000. In December, 1871, the St. Gothard Railway Company was organized, $6,800,000 stock and $13,600,000 of bonds were issued, a contract was made calling for completion in eight years, with a forfeit of $1,000 for each additional day and a bonus of $1,000 for each day gained upon the contract time. Work began in the summer of 1872, and it was soon discovered that the estimates were wrong, and that $57,800,000 would be needed to carry out the plan; a crisis followed, and the enterprise seems to have been saved only by what had already been invested in it, leaving no way out but to push ahead. The railway proper extends 113 miles from Immensee, in Switzerland, to Chiasso, in Italy, and more than one fifth of the whole line is in tunnels—fifty-six in number; many of these are not straight, but actually spiral, accomplishing heavy ascents in short distances, and there are also many lofty viaducts, bridges, and complicated galleries. The total length of tunneling is 23 miles. The main or great tunnel is 9¼ miles long, although others, exceeding 6,000 feet, might be thought noticeable elsewhere. The great tunnel is 26 feet wide and 19 high. The modern boring machines were worked by air compressed by large turbine wheels driven by the rapid river Reuss. The air was carried from the compressors outside to the borers within the tunnel in iron pipes of six inches diameter, and the escaping air served an indispensable purpose in ventilation; 3,500,000 feet of compressed air were daily thus delivered and set free, pushing back and out of the tunnel the bad natural gases, with those set free by the dynamite and thrown off from animals and workmen. Fifty drills were worked; the usual daily advance was 21 feet, working from both ends, and the whole excavation was lined as fast as made with a circular tube of masonry, 18 to 30 inches thick. The workmen were principally Italians, who worked eight hours a day, receiving 60 cents to $1 20 per day (mostly the former), boarding themselves, and living chiefly on meal porridge; yet most of them are reported to have saved and sent home to their families a part of this pittance. The tunnel cost 310 of their lives, and wounds were inflicted upon 877. The final actual cost of the tunnel and railway, exclusive of rolling stock, is now reported at something over $40,000,000.

Live Worm in a Horse's Eye.

A case of parasitism somewhat rare in this country is attracting attention in Jersey City. About three months ago a driver in the employ of Dodge & Bliss noticed a worm in the eye of one of his horses. It was then about one inch long, and black. Now it is three inches long, and white.

Mr. W. H. Arrowsmith, of the American Veterinary College, tells the *Sun*:

"The disease is one seldom seen here. It is called in the books filariæ oculi, and is very prevalent in warm climates, in India, Australia, and in Arabia. It is supposed to be due to germs taken into the body when the animal is feeding upon grass in low, marshy ground. The germs or eggs of the parasite are developed into the active life of a worm, and that worm penetrates to different parts of the body, sometimes to the eye, sometimes to the brain, sometimes interior organs. But it has been so seldom seen either in Europe or here that comparatively little is know of its progress, development, or results. There have been, I believe, but four or five cases reported in both Europe and this country. When fully developed, as it is in the eye of the horse of Dodge & Bliss, it is a parasitic white worm, varying from one to three inches in length, and about as thick as an ordinary pin. While in the aqueous humors of the eye it is in continual motion. When I examined it this morning by means of the ophthalmoscope, I found it in the anterior or aqueous chamber of the eye. It was very active. The cornea of the eye was somewhat opaque, and the iris somewhat distended. By careful observation we could discern a granular surface upon the anterior face of the crystalline lens. The horse otherwise was in perfect health. He works, and does not show any apparent inconvenience, with the exception of a certain nervousness during examination of the eye. The activity of the parasite is such at present that it is impossible to say whether it has a head or tail, or what its internal construction may be. But, from microscopic observation, we will probably be able to discover head, tail, and alimentary canal. According to Percival's 'Hippo-pathology' and Williams' 'Veterinary Surgeon,' even the sex of these parasites is clearly discernible under the microscope. I do not believe that this parasite is ever found in human beings, but only in grass-eating animals that have grazed in low, marshy ground; and that it is in the eye is only a matter of accident in the course of its penetration of the body of the horse."

An Electric Storm.

The past ten days have been characterized by wide-spread electrical disturbances, which culminated in intensity November 17. On that day telegraphic communication was more or less interrupted over the northern half of the United States, and much damage was done to switch boards and other telegraphic apparatus. The disturbance extended across the sea, interfering seriously with the work of the cables, and made itself felt in many parts of the European continent.

The manager of the operating room of the Western Union telegraph building pronounced the disturbance the most serious he had ever encountered. The storm was the severest between 5 o'clock A.M. and noon. It seemed to be centered along the valley of the Mississippi, and at its greatest severity in those parts of the country north of the latitude of Washington. The only wires that could be used at all were those on the metallic circuits. All the cables and wires that touched the ground circuits were absolutely useless. Shortly after 1 o'clock the storm very suddenly disappeared, and work was resumed on all the wires.

It is said that various experiments were tried by telegraphers during the prevalence of the storm to work the wires and dispose of the great accumulation of business, but with little success, until it was discovered that by taking two wires from the ground between any two given points and joining their ends a metallic circuit was formed that could be operated. In this way eight wires between Buffalo and Chicago were made to do service as four. Electricians seem to agree that the disturbance was unlike any heretofore experienced, as it appeared in some cases to act upon the wires in strong waves, causing a constant changing of the polarity of the current.

In other places the sending of messages was possible, as in previous electric storms, without using a battery. A dispatch is said to have been transmitted from Bangor, Maine, to North Sydney, Cape Breton, a distance of 700 miles, in this way. Brilliant auroras were generally seen where the sky was clear on that and subsequent nights.

The appearance of exceptionally large sun spots is believed to have more than an accidental connection with these disturbances of the earth's electric equilibrum.

The Laws of Breeding.

In a note to John L. Hayes, LL.D., editor of the *Bulletin of the National Association of Wool Manufacturers*, Mr. William H. Brewer, an authority on the laws of breeding, says he knows of no case where a new breed has been made of *two* well-defined breeds, the new breed having the excellences of the others, or even the excellences of a first cross. It is a common experience, he continues, that while the first or earlier crosses are reasonably uniform, successive crosses vary greatly. On the other hand, numerous examples may be given of new breeds being formed from the crosses of several, and then, by long-continued selection of animals having the desired qualities, from three several breeds. Mr. Brewer further says:

"Again, it is a common experience, particularly in breeding for flesh (but it is true of all characters), that in cross-bred animals for one or two generations the cross breeds may be better as animals of use than *either* of the parent stocks. But this excellence cannot be maintained with a sufficient uniformity to insure profit. In truth, the whole and sole reason of the enormous prices which thoroughbred animals of various kinds bring, of a long proved pedigree, is not because of the superior excellences of those animals themselves as animals of use, but simply because their characters are transmitted, and those of equally good mongrels are not. The crossing of different breeds of sheep for mutton or for particular grades of wool will long be continued, and is very profitable in many directions; but it is only profitable, so far as I have been able to hear, where these rules are obeyed, and we frequently go back to the pure breed, on one side or the other, for keeping up the excellence.

Beer Glasses in Berlin.

The large breweries that surround Berlin sell a considerable quantity of beer on draught, each brewery being provided with a large garden or saloon, not unlike Lion Park, at One-hundred-and-tenth street and Ninth avenue, in this city. On Sundays and holidays, a great concourse of people, many of them whole families, assemble there to quaff the national beverage fresh from the rock cellars. Of course it requires a large number of beer glasses (Seidel) to supply them. The Moabit brewery uses 11,000 glasses; an export brewery there, 22,500; the Union, Friedrichshain, New World, and Spandauer Bock, each use 12,000, while 10,000 are used in the "Zelten." Beer is also sold at the zoological garden, where 25,000 *Seidel* are in use. About 75,000 more are in use at the large breweries on the south side of Berlin, where the Tivoli Society, Hasenhaide, and Bock breweries are situated. This total of nearly 200,000 glasses does not include smaller establishments like Belle Alliance, Walhalla, and hundreds of other gardens, hence the total number used annually is estimated, says the *Amerikanischer Bierbrauer*, at 5,000,000, or four glasses to each man, woman, and child. What may seem more surprising to our readers is that 10 per cent of the glasses used in Berlin are imported from this country, mostly from Wheeling, West Virginia. Many of the other glasses are "imitation American," and come from Schlesia, the rest from the Rhein. About one-third of the whole number pass through the hands of a single house in Berlin.

Purification of Sulphuric Acid by Crystallization.

In the *Zeitschrift für Analytische Chemie*, Tjaden Modderman remarks that he has for some time been accustomed to prepare pure sulphuric acid by recrystallization of the hydrate ($H_2SO_4H_2O$), and finds this seldom adopted method of purification to be really an excellent one. The author has experimented in this way upon acids containing considerable quantities of lead and arsenious and nitric acids, etc., and by protracted recrystallization has in all cases obtained a pure acid from them. The method is very simple. The acid is mixed with sufficient water, and, in bottles two-thirds full, exposed to the cold in the open air on a frosty night. If the mixture has been properly made, it is generally frozen throughout the next morning. The chief thing then is to carefully separate the crystals from the mother liquor, and for this purpose the author employs a centrifugal apparatus, so constructed that the acid only comes in contact with glass. The separation is very easily effected, and, except in cases where an acid is strongly contaminated with the different oxides of nitrogen, one recrystallization is generally sufficient.

A Town and the Cholera Blown Away by a Hurricane.

The Captain-General of the Philippine Islands telegraphs from Manila, October 21, that a tremendous hurricane had almost entirely destroyed that town. In less than an hour from its commencement not a single native house and not a single wooden house was left standing. Almost all the stone buildings, even those having iron rafters, were unroofed and made uninhabitable. Comparatively few casualties had taken place among the population. In a later telegram the Captain-General says that the authorities of Balacan and the interior of the island report a similar destruction as caused by the hurricane, and fifteen thousand more persons are houseless. Singularly enough, on the first day after the hurricane not a single case of cholera occurred in Manila or the island. The tornado not only swept over the entire archipelago, but was felt many hundred miles out at sea, especially to the south and west. It is believed that more lives have been lost by shipwreck than on land.

The Meat we Eat.

According to statistics compiled by the Agricultural Bureau, the annual meat product of the United States is in round numbers:

	Number.	Pounds.
Dressed hogs	20,000,000	5,120,000,000
Beeves	6,250,000	3,124,000,000
Veals	3,000,000	275,000,000
Muttons	7,000,000	350,000,000
Lambs	5,000,000	100,000,000

About one-fourth of the pork and one-twelfth of the beef are exported, leaving for home consumption about seven thousand six hundred and fifty million pounds of the above meats, mostly beef and pork; or an average of almost half a pound a day for every man, woman, and child in the country. We think this must be erroneous, and the above figures probably need correction.

Preservation of Lemon Juice.

A correspondent in *Mém. de Méd. et de Pharm. Milit.* says, after various experiments and the test of eight months' exposure to the sun and heat of summer, he has come to the following conclusion: "Heating the juice or adding alcohol to the same would appear to be superfluous, as it is only necessary to filter it and keep it in sealed bottles; however, since filtration proceeds so very slowly, the best way is perhaps to add 10 per cent of alcohol to the fresh juice, and bottle.

The *Pharmaceutical Journal* observes that it may be preserved without the addition of alcohol by heating it to 150° F., and then excluding it from the air by carefully closing the full bottles at this temperature. The operation should be carried out in winter.

Consumption of Watch Glasses.

According to the *Revue Chronometrique*, there are annually manufactured 2,500,000 watches, and during the last fifty years more than 70,000,000 have been put on the market; there remains yet for us to add a stock of not less than 50,000,000 of old watches, which makes a total of 86,000,000 to 87,000,000 watches requiring glasses. The new watches consume nearly 4,000,000, which makes an annual consumption of not less than 47,000,000 of glasses. But we must add that every watchmaker away from a town sees the necessity of always having on hand an assortment responding to the wants of his customers. Then if we take into account children's watches, lockets, compasses, etc., one finds one's self with astonishment in the face of an annual consumption which cannot be less than 100,000,000 of glasses.

Subterranean Scenery.

Mr. H. C. Hovey, perhaps the only man who has ever made a special study of all our great American caverns, lectured in the Hall of the Academy of Sciences, New York, Nov. 20, upon subterranean scenery. He gave descriptions of the Mammoth, Luray, and Wyandotte Caves, and the ice grottoes of Niagara, and illustrated the marvelous scenery found in them by means of lantern views. This is a new field for lecture enterprise, and one that cannot fail to be as popular as it is interesting.

IMPROVED FLOATING ELEVATOR.

(*Continued from first page.*)

filled by the number of men intended to be employed, thus insuring at all times receptacles for the coal to be loaded into. Payment for the work being made by the ton and not by the day or hour, the importance of this margin of capacity will be apparent.

For the purpose of raising and lowering the elevator arms, a large double cast-iron drum is provided, from which two chains are passed over the deck and led round sheaves into and up the steel lattice tower, and over the cast-iron head to the blocks from which the two elevator arms are suspended The drum is provided with a brake-wheel, brake, pawl, and ratchet-wheel, and the engines have reversing motion. The third set of gearing consists of a powerful worm-wheel, keyed on to the lower end of the cast-iron column within the lattice tower, the worm driving this being connected by means of bevel gearing to the second-motion shaft of the engine, these three distinct sets of gearing being set in and out of motion by independent clutches, the handles of which are conveniently placed with regard to the engine. A warping drum is also placed on the end of the third-motion shaft. Two hand winches, E E¹ (Fig. 3), enable the angle of the elevator arms to be accurately adjusted and varied to suit the steamer's hatch and the load in the lighter. In addition to the four rings at the ends of pontoons, four towing-bits are attached to the deck for mooring. It should also be added that the six cylinders or pontoons, three on either side, are totally separate and distinct from each other, all the plates being riveted to welded angle-iron rings.

For coaling the bunkers on that side of the steamer which is next the elevator, a return chute (see cuts) is provided with an adjustable double metal trunk which can be set to suit steamers of various beams, and to the mouths of these pipes flexible trunks are attached, which lead the coal into portable hoppers placed in the bunker holes. A conveyer or belt is erected upon portable trestles, readily placed for the purpose upon the steamer's deck, the gearing at the head of the elevator driving this.

As regards the performance of the elevator above described, Mr. Rigg gives in *Engineering*, from which we take our engravings, the following as a fair estimate of the economy resulting from its use in the purpose for which it is mainly intended, viz., the coaling of steamers, and, to avoid any appearance of exaggeration, a liberal amount is allowed for working charges, and it is assumed to be in active operation for three days in the week only; a crew of four is sufficient to discharge the duties on board the pontoons and in making the connections to bunkers. The rate for filling the passing trays on the continuous chains is taken at the same amount as is paid for loading the baskets now passed from man to man connecting the barge and bunker, as previously described. The labor of trimming in the bunkers being the same in each case, these charges also are alike.

Cost of Bunkering Coal with Patent Elevator.

	£	s.	d.
Engineer per week	2	0	0
Stoker	1	7	0
Additional labor (two men).	2	10	0
	5	17	0

Depreciation:

Elevator, including engines, boilers, gearing, and pontoons	£ 2400		
Coal distributing troughs,	100		
	2500		
10 per cent per annum for one week on £2 500	4	16	2
Coals and stores per week (3 working days)	3	5	0
	13	18	2

Filling:

	£	s.	d.		
Eight men, each 7 tons per hour = 56 tons per hour or 560 tons in 10 hours (1 day) = 1,680 tons in 3 days at 1¼*d.* per ton	8	15	0		
Trimming 1,680 tons in bunkers at 2½*d.*	17	10	0		
Royalty on 1,680 tons, at ½*d.*	3	10	0		
	43	13	2	= 0	6¼ per ton.
Present average charge 1,680 tons at 1*s.* 6*d.*	126	0	0	= 1	6
	82	6	10	0	11¾

Assuming a steamer taking 1,000 tons in her bunkers, the following would be the application of the above figures:

Loading by patent elevator 1,000 tons, at 6¼*d.*	26	0	10
Present charge by stevedores for manual labor, 1,000 tons at 1*s.* 6*d.*	75	0	0
Difference	48	19	2

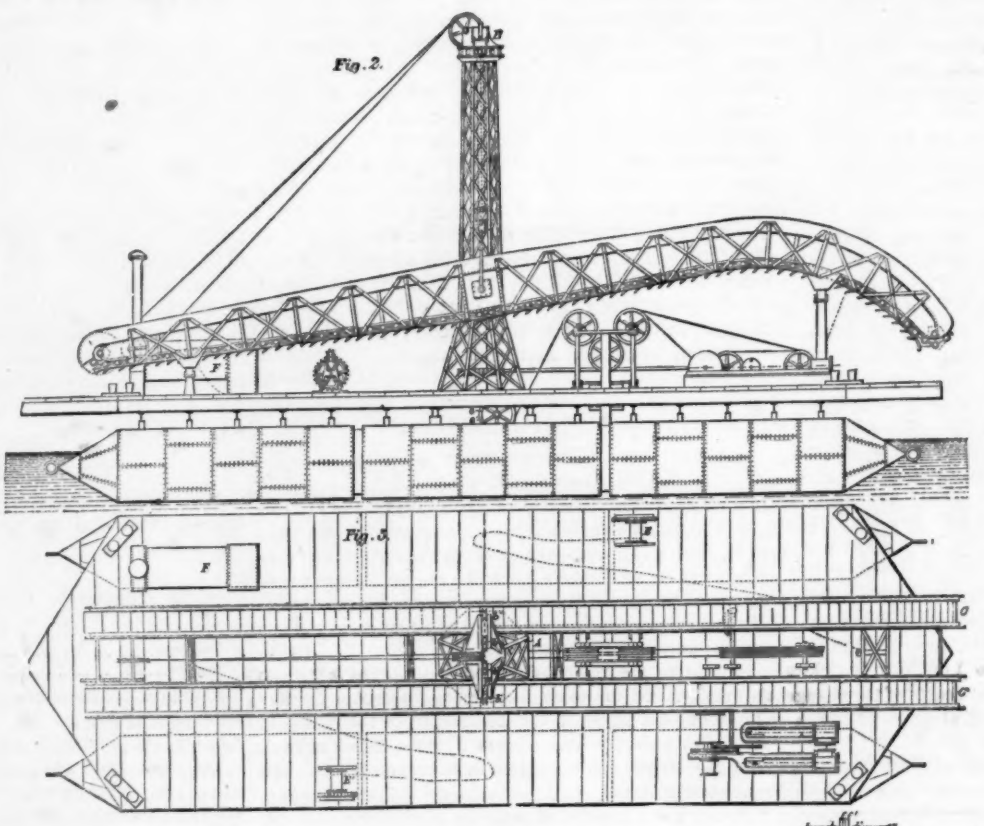
It will be seen that the above figures show a great difference in favor of the patent elevator over manual labor, and that an ample margin remains for profit for the coal stevedore.

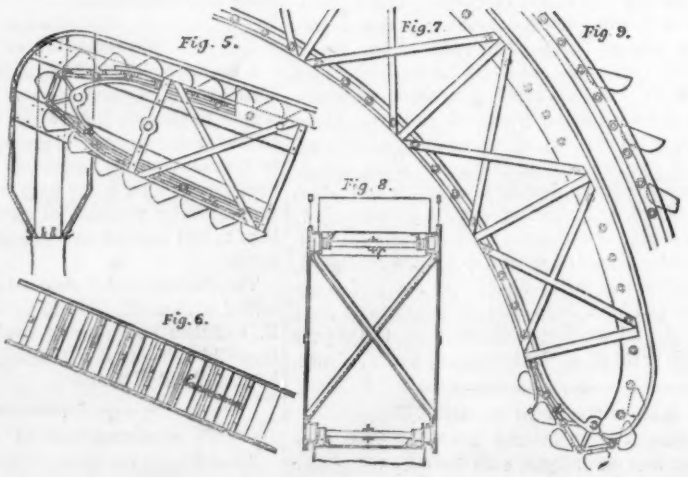
These figures are interesting, and clearly point to the great economy which may be obtained in the coaling of steamships, and the importance of this subject to their owners and the stevedores who now have the work performed by manual labor. The machinery being constructed of a capacity equal to double that of the eight men represented as loading, this number may under pressure be increased.

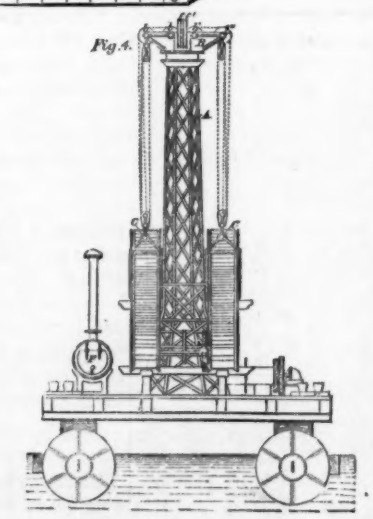
One of the secondary advantages is, that whereas coal barges must now be placed at each side of the steamer, the introduction of this elevator enables them to be used on one side only, leaving the other at liberty for loading cargo. The same apparatus is also available for loading salt and any other material, which is now similarly dealt with by hand. Suitably constructed buckets render the elevator also available as a dredger, the hand winches E E¹, Fig. 3, affording the ready adjustment of the elevator frames which is so essential.

The general dimensions of this elevator are as follows: Six pontoons, each 20 ft. long by 6 ft. diameter; length of pontoons over all, 71 ft. 4 in. length of deck over all, 74 ft.; beam, 24 ft.; height of central; lattice tower from deck, 28 ft.; length of suspended elevator girders or frames, 68 ft. 3 inches; pair of winding engines, 7 in. cylinders and 14 in. stroke; total weight, 66 tons.

This one has recently been constructed by Mr. Rigg for a foreign grain port, the buckets being of the form shown in Figs. 5 and 7, suited to grain, and it will be readily seen that a flow, which is practically continuous from two endless chains of buckets, will transfer more grain in a given time than steam or hydraulic cranes, which from their nature must be intermittent in their operation. For working grain a pair of timber bonnets are placed over the head of the elevator, and to these are attached flexible tubes for leading the grain into the hold. As a protection from the weather the troughs also, along which the buckets travel, are covered by removable waterproof sheets.







IMPROVED FLOATING ELEVATOR.—[See first page.]

What is the Comet made of?

MM. Thollon and Gouy have communicated to the French Academy of Sciences the results of their spectroscopic observations on the large comet now visible. It appears from these, says *Engineering*, that at the observatory of Nice, on the 18th of September, they detected very brilliant rays of sodium, which were slightly displaced toward the red. On the 9th of October the sodium lines had disappeared, leaving only four ordinary bands of carbon, of which the violet band was very distinct, but feeble, while the others were bright, especially in the head. This gave at the same time a continuous spectrum, in which could be seen a great number of black and bright rays. On the 16th of October the spectrum was much the same, except that the violet band had almost disappeared, and the continuous spectrum had become feebler. The spectrum, in fact, showed a striking resemblance to that of the flame of alcohol. Of course this does not imply that alcohol is present in the comet, since it is known that all compounds of carbon give the same bands, and of these alcohol was only chosen because it was most convenient for comparison. The "integral spectrum" taken by a direct vision spectroscope, showed that the major portion of the comet's light was white, and probably reflected sunlight. The vanishment of the sodium lines and other brilliant rays would seem to prove that the spectroscope cannot give a complete analysis of cometary matter. It is probable that this matter is similar to that of aerolites; and if the temperature of the comet is sufficient to produce an emission spectrum from the compounds of carbon, it ought also to give a spectrum of sodium: but this, as found by MM. Thollon and Gouy, is not always the case. They are, therefore, led back to the electric theory of comets. It is known that if a carbureted gas is traversed by the electric discharge from a Holtz machine deprived of condensers, the gas kindles and gives the carbon bands; and if it hold metal dust in suspension, it will give the bands without showing the lines of the metals. Something of the same kind possibly takes place in comets.

Petroleum Manufactures.

A census bulletin of statistics of the manufacture of petroleum during the year ending May 31, 1880, shows there were 86 firms and corporations in the trade, with an aggregate capital of $2,739,746, and giving employment to an average of 9,869 hands, 25 of them women and 346 children. The annual wages paid amounted to $4,381,572. The value of the raw materials used was $35,000,000, and the value of the manufactured products was close upon $44,000,000. There were in use 374 boilers of 12,744 horse power; 385 engines, 200 pumps; buildings to the value of $1,899,288, and machinery valued at $3,737,998. The losses for the year from fires and other accidents were $104,631.

Free Canals and Canal Improvements.

One of the notable features of the recent election in this State was the enormous vote in favor of entirely abolishing tolls on the State canals. For a long time the great food staples and some other commodities have been on the free list, and latterly all the West bound freight has been exempt from tolls. Under the new law the Erie Canal and its tributaries will constitute a free waterway the whole length of the State, from the Hudson River to the Great Lakes, for eight months of the year. The canals give employment to about 6,000 boats.

The object of the abolition of tolls is to increase the traffic of the canals, so as to make them a more potent factor in solving transportation problems, and in helping to maintain the commercial supremacy of New York. How far the end aimed at will be furthered by the change remains to be seen. The inability of the canals to be the dominant factor in controlling the charge for transportation across the State, and in determining the course of trade in competition with railways, however, would appear to be due less to the amount of tolls hitherto demanded, than to the inability of the canals to meet promptly and parallel the improvements in transportation introduced by the railways. In carrying capacity and economy in transportation the railways are progressive, while the canals are, or have been, practically stationary.

As Mr. Robert Taylor, of this city, has pointed out, the Erie canal boat, towed by two horses, and the 20-car wheat train hauled by a 30-ton locomotive, were for many years equivalent units in wheat transporting capacity, with the advantage of greater economy in favor of the canal.

"So long as this continued, the canal was the regulator of grain freight rates, but as the volume of grain transportation increased, railway improvement was stimulated, and the advent of heavy steel rails suggested better ballasting of the road bed and heavier and closer laid ties. Then came the 70-ton Mogul locomotives, which could fairly fly with forty cars, each containing 500 bushels of wheat—a train load of 20,000 bushels—when the railroad became the regulator of grain freight rates, being able to carry at much lower prices than the canal could possibly carry at, even at 2½ cents, if necessary, and make money."

To raise the canals to their old commercial rank two things are proposed. One is to make the Erie Canal throughout a ship canal, a costly undertaking, and one that might prove the reverse of beneficial either to New York or to the cities along the line of the canal, as the actual benefit of the change would fall rather to the producers and shippers of the far West than to the people of New York.

Another and more reasonable proposition is to increase the carrying capacity of the canal by improving the existing lock gates. The old fashioned, slow moving swinging gates are still used. By a change to lift gates, which could be done without great expense, the available length of the locks would be increased by 35 feet, and the canal boats might be made 130 feet long instead of 97 feet as now, with a proportional increase in their carrying capacity, or from eight thousand to ten or eleven thousand bushels of wheat. The cost of operating the larger boats would be little, if any, greater than for the boats now in use. With improved lock gates, it is further claimed, the carrying capacity of the canal might be five times what it ever has been.

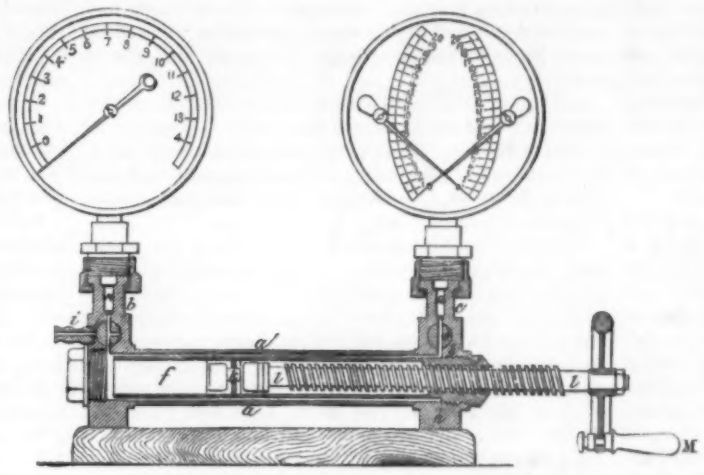
Touching the proposition to abandon the canals entirely as having outlived their period of economical usefulness, it is urged that water carriage remains, and is likely always to remain an important commercial factor, even where railroads are most abundantly developed. Proof of this is seen in the large use of the great canals of England and Scotland, and in the efforts which the more advanced European states are making to extend their facilities for water carriage. Thus in France 74 per cent of the domestic commerce of the country goes over the canals, and efforts are making to largely increase the capacity of such artificial waterways. Germany, likewise, has entered upon the work of enlarging and improving the 2,000 miles of canals within the limits of the empire, and Holland and other states are spending large sums for a like purpose.

A FLAGEOLET player charmed all his hearers by his musical performances at Neuilly, near Paris. He had formerly suffered from diphtheria. Tracheotomy was performed, and the silver tube which was introduced at the time of the operation, and kept stationary by means of a circular pad, now serves the musician of Neuilly as a natural aperture through which he breathes, and so successfully that his flageolet playing was enthusiastically applauded by all present.—*British Medical Journal.*

APPARATUS FOR TESTING PRESSURE GAUGES.

The accompanying cut represents a small portable apparatus designed to test pressure gauges, and which is the invention of Mr. C. D. Gäbler, of Hamburg.

It consists of a brass cylinder, *a*, with tubes, *b* and *c*, provided with cocks, *d* and *e*. In the interior of this cylinder there is fixed, by means of a screw, *g*, a small pump chamber, *f*, in which moves a piston, *k*, actuated by a screw, *l*, with winch, M. When it is desired to use the apparatus, the gauge to be tested and a standard apparatus are connected with the cocks, *d* and *e*, as shown in the cut. But the apparatus must first be prepared by adapting to the tube, *i*, a piece of rubber tubing whose other extremity dips into a glass of water. The conduits, *n* and *m*, are then closed by means of the cocks, *d* and *e*, the latter, which is a three-way one, being turned so as to admit water through the tube, *i*.



APPARATUS FOR TESTING PRESSURE GAUGES.

The piston, *k*, is afterward led, by means of the screw, *l*, to the extremity of its travel, and the inner cylinder is filled with water. Then the cocks, *d* and *e*, are opened so as to allow the air to be disengaged, and the piston is gradually pushed in, so that the water shall rise above the tubes, *b* and *c*. The cocks are then closed, and the piston is withdrawn, so that the apparatus is entirely full of water. The two gauges can now be fixed to the apparatus. It is evident that on driving the piston forward the two gauges will be submitted to pressure, and that they may be easily compared in measure as the pressure rises.

For testing barometers, the operations are the same, save that the piston must be driven into the cylinder when the barometers are affixed to the apparatus. When the piston is withdrawn, a vacuum is created. It has been found that on maneuvering the piston twice in succession, care being taken to place the cock, *c* and *d*, properly, an almost perfect vacuum may be produced.

This apparatus has been devised for shops, and, as it is very portable, and takes up but little room, it is capable of rendering service to inspectors of boilers.

CATAPULT FOR THROWING LIFE LINES.

This apparatus is designed for affording a sure, speedy, and safe means of escape from the interior of burning buildings, from sinking vessels, and other places of danger. As shown in the engraving, the apparatus is supported by four wheels like an ordinary wagon. It is provided with a very strong frame, upon which is mounted sector wheels, which are moved by a pinion on the crank shaft, to adjust the elevation of the powerful compound springs mounted on a frame of which the sector wheels form a part. These springs are fixed at their larger ends to the frame near the pivot of the sector wheels, and their free ends are connected by a cross bar carrying a cup which receives the ball attached to the line to be thrown.

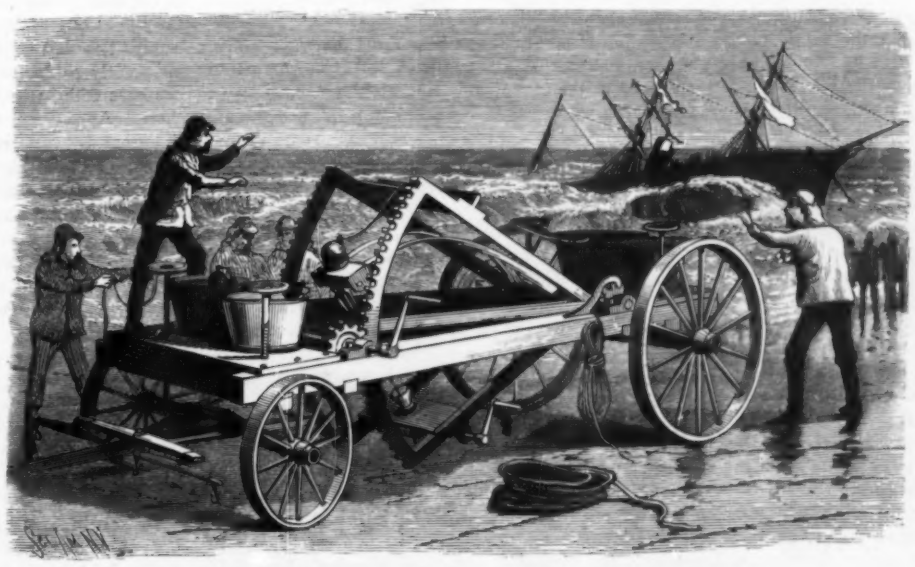
On the lower part of the bar to which the cup is attached is fixed a hook which is caught by nippers attached to a rope wound on a windlass journaled on the lower arms of the sector wheels. The rope is wound through a funnel which serves to trip the nippers and release the springs when it is desired to project the ball.

That part of the frame not occupied by the gearing, sector wheels and springs is floored over, and at convenient places thereon are placed coils of lines or ropes with balls attached in light movable cans with flaring sides, the line to be first thrown being placed on the rear of the frame in the center. In diagonally opposite corners of the frame are embedded four levels, two in each corner, and its frame can be made level by means of the leveling screws passing through nuts in each corner of the frame, whatever be the inequalities of the surface on which the wheels rest.

In practice the apparatus is kept in readiness for removal at an instant's notice, with the sector wheels elevated as far as possible and made stationary, the nippers caught on the hook at the end of the springs, and the rope held taut by the windlass. Having been rapidly hauled to the scene of operations, the apparatus is turned with the rear toward the place where the danger is. The apparatus can be then turned or aimed in any direction by simply backing the horses. The direction having been obtained, the frame is rapidly leveled by means of the leveling screws, the desired elevation obtained by the gearing operating in the sector wheels, the ball to which the line is attached placed in the cup, and the springs brought down by the rope and windlass till they are loosed by the nippers being drawn into the funnel, when the ball carrying the line will be thrown to the desired place.

Should it be desired to reach more than one point, any number of lines which may be prepared could be thrown by removing the can containing the line first thrown and replacing it by another.

Seats may be arranged on the frame for the entire crew needed to manage the apparatus, three men being all that is required—one driver and two to manage the apparatus. Such a crew, with practice, would become so skillful that within a few minutes of its arrival at the scene of danger it could throw a line into any specified window or aperture of any building, or over any building or vessel, and thus provide a means of escape. Further information may be obtained by addressing the inventor, Philip W. Claypool, Summitville, Col.



CLAYPOOL'S CATAPULT FOR THROWING LIFE LINES

Absorption of Moisture by Building Materials.

Every one connected with buildings of brick and stone knows the absorbent nature of those materials under the most favorable circumstances. It would astonish most people, adds the *Building News* (London), to be told what a large quantity of water is stored in the brick walls of an ordinary house after a heavy rainfall; the drying or evaporation of which must take place inside in cold weather, unless proper precautions are taken to render the walls impenetrable. The plea for hollow walls has been raised again and again in this journal, and though the system is coming to be adopted more generally in some districts, the idea of solidity of wall structure seems to have taken too deep a hold on the ordinary building mind to be given up. Some time ago a suggestion was made that colliery owners, and others who have large quantities of slag, might with profit utilize this material for building cottages and other purposes. We are not sure whether the hint was taken, but in some parts of the country the material furnishes an admirable aggregate for concrete. Where good aggregates exist like slag, broken brick, sandstone, or furnace ashes, concrete building ought to be much cheaper than brick, as no skilled labor is required.

There is another consideration besides cost which tells in favor of concrete, and that is the non-porosity of walls so constructed. Not only does brick absorb moisture in wet weather, but it is now known to absorb animal gases as well; and here we have a condition which builders of our hospitals and infirmaries ought to be reminded of. We are not sure if concrete has been applied to any buildings in England of this kind on a large scale, but as absorbent walls are known to be injurious in harboring the germs of infection, the value of walls constructed of concrete, made of burnt aggregates, cannot be overrated. Slag-made concrete has the great advantage of being fire resisting, the material in its rough state having been subjected to intense heat. There is nothing in it to "kill" the cement, and the rough surface of walls built with it becomes an excellent "key" for the plastering. In the construction of walls of this material, three sizes of the slag may be used; the larger lumps being packed in layers in the middle of the wall, and the other two sizes, the larger of the size of walnuts, run in with cement on each face in the proportion of eight to one.

Slates.

Slate is a metamorphic clay rock, frequently fossiliferous. It is readily divisible into thin plates, and being easily worked and smoothed, is much employed for roofing and in the manufacture of mantels, billiard tables, and other similar objects. In the quarry, the direction of these cleavage planes is usually vertical, or nearly so, but never coincident with those of the beds and joints. The masses are, therefore, removed by cutting trenches in the side of the hill and splitting the rock in vertical layers. As the perpendicular breast becomes too high for convenient working, say 40 feet, a second trench is cut above the first; then a third, and so on.

In the great slate quarries of Ybron, six miles southeast of Bangor, in North Wales, sixteen of these stages are in progress together, the lower ones being gradually widened by the getting of the slates as the upper ones are advanced. In the upper part of the quarry the slates are removed with crowbars; but the slates become harder as they are lower from the surface, and require the use of gunpowder to detach the main masses. The miners engaged in drilling the holes for the powder are suspended by ropes from the upper parts of the rock, and are liable to many and severe accidents. After the slates are detached by powder or otherwise, they consume considerable labor in splitting them with wedges and mallets into marketable sizes and reducing them to the several grades required for roofing and other purposes.

Slate adapted for ordinary economic purposes is not very common. A number of varieties are, however, found in Cornwall, Wales, Scotland, and Ireland, and also on the continent of Europe. Those from the Ardennes, from Angers on the Loire, and from Nassau are largely exported.

In this country, according to the *Glassware Reporter*, Vermont furnishes slates of unsurpassed quality and beauty. Their quarrying and manufacture are beginning to constitute an important feature of national industry, promising large increase in the future. Northampton county, Pa.; the vicinity of Bangor, Maine; Washington county, New York; Hartford county, Maryland; the Huron Mountains, Michigan; and Pike county, Georgia, also furnish supplies of slate.

Of the various kinds of slate, aluminous yields alum; adhesive slate is porous and adheres readily to the tongue; bituminous slate yields coal oil; whet slate has a fine grain and makes hones; hornblende slate, a tough kind, is used for flagging and sidewalks; drawing or graphic slate, a soft kind containing carbon, is used for pencils; polishing slate, which has a peculiarly fine grain, and is found in Bohemia, is used in slips and powder; and clay slate, consisting of alumina and silica, makes a refractory fire brick, from the absence of fluxes.

The slate used in roofing is a thin, riven slab. The upper surface of a slate is called its back, the under surface the bed, the lower edge the tail, and the upper edge the head. The part of each course of slates exposed to view is called the margin of the course, and the width of the margin is called the gauge. The portion hidden from view is called the cover. The bond or lap is the distance which the lower edge of any course overlaps the slates of the second course below, measuring from the nail hole, and may be from two to four inches.

In preparing slates for use, the sides and bottom edges are trimmed, and the nail holes punched as near the head as can be done without risk of breaking the slate, and at a uniform distance from the tail, regard being had to the spring of the laths. Slates are laid on laths, battens, or sheathing, and must break joint. The nails are of copper, zinc, or tinned iron. In England 1,200 slates constitute a thousand, and they vary in size from 1 foot 1 inch in length by 6 inches in breadth to 3 feet in length by 2 feet in breadth. A "thousand" will cover from two to fifteen squares, according to the size of the slates, and will weigh from three-quarters of a ton to six tons on the same basis. Four hundred and eighty of the smallest size will cover a square, and 127 of the medium size (Duchesses) will do the same. The number of nails required to a square varies, the smallest size requiring the most. The smallest size will take 480 nails, and the largest about 250. There are still other sizes sometimes enumerated, such as "small," "plantation," etc.; these range from 11 x 7 inches to 22 x 12. The general dimensions of American roofing slates are from 14 x 7 inches to 24 x 16 inches. The thickness of slates ranges from three-sixteenths to five-sixteenths of an inch, and their weight from 2·6 to 4·53 pounds per square foot.

A square of slate or slating is 100 superficial feet, that is, a surface 10 lineal feet each way. The pitch of a slate roof should not be less than 1 in height to 4 of length.

Slate is superior to most other articles for roofing purposes, both as to durability, appearance, and capability of resisting moisture. It will imbibe only about one two-hundredth part of its weight of water, while glazed tiles will imbibe one-seventh their weight. Slates are also much lighter. They cannot, of course, be used for flat roofs, or those of very low pitch; they are irreparably injured by fire, and they will not allow of much harsh usage in the shape of heavy treading on them by mechanics or other who require access to roofs on which they are used. They are also more easily displaced by high winds than tin and some other roofing materials, in consequence of the readiness with which the wind can gain entrance at the joints. But from their fine appearance and effectiveness when well laid they have long been and will continue to be extremely popular for roofing purposes.

School slates are made from a fine and soft quality of slate. The great demand for them has led to various improvements in the manner of making and uniting the frames, and to the invention of special machines for this purpose. Slate frames are now generally made with rounded angles, and one invention consists in securing the parts together more firmly by wires entering grooves at the corners, and having bent ends, which are inserted into holes in the side and end pieces.

Artificial slates are prepared by coating the surface of wood or cardboard with a gritty substance, as pulverized emery or pumice, mixed with black size or paint, or the surface is painted black, and dusted with the powder before it becomes dry.

About Poultry.

Among the multifarious letters which we receive daily, the following appeals peculiarly to our sympathies:

Sir: Having several times noticed in your columns advice given to young men who are about to embark in some business enterprise, and having always appreciated the good and sound judgment you have evinced, we apply to you in our own behalf.

Having sufficient capital to go into business of the produce nature, we come to you for counsel concerning the raising of poultry. Which, in your judgment, would be better adapted for the poultry business on a good sized scale —New Jersey or Long Island? Also, what part of either would be best to start in?

Our aim is to raise poultry and send it to this market ready for sale by city dealers. Yours respectfully,

New York, November 10. POULTRY.

No doubt the poultry business is capable of being made a source of profit, though for our own part we confess we have not found it so. We embarked in it on a pretty large scale five or six years ago, and having made careful preparations, we raised the first year about 1,000 first class white Brahma fowls. But just as they had gained perfection, and while the eye was delighted with their beauty and the financial mind calculated that they would sell promptly for about $3 apiece, some egoistic wretch or wretches broke into our yards, took off the hinges and hasps of the great gate, and when the sun rose in the morning, shedding his glorious light over the whole face of nature, some 500 or 600 of our choicest pullets had disappeared, whither we knew not; and thus the profits of the year were much reduced.

All this happened on Long Island, and therefore our advice to our correspondents would be either to avoid that locality altogether, or at any rate not to plant their poultry breeding establishment too near the Sound, where a swift sail boat or steam launch may afford facility for the escape of plunderers with their booty.

And yet the soil, the air, the sunshine, the grass, and the water of Long Island are exceedingly favorable to the production of good poultry; and, on the whole, our advice to our friends would be rather to take Plymouth Rocks instead of Brahmas, Langshans, Crèvecœurs, or any other fancy variety. Game fowls are very good to eat, but there is not much flesh on their slender and steely bones, and at the the same time Mr. Bergh, with his vigilant care of the public morals, will not tolerate any of the profits which might be derived from cock fighting. Leghorns are undoubtedly very productive of eggs; but the mischief of it is that they do not lay their eggs at times when eggs are most wanted, and some of our friends who have been led into the cultivation of Leghorns, through a mistaken faith in their ovarian capacities, have been sadly disappointed, and have got neither eggs nor chickens. Alas, alas!

The feeding of poultry is an important matter, requiring both scientific knowledge and artistic skill. The main thing in a proper gallinaceous diet is undoubtedly grain; and cracked corn, wheat screenings, Indian meal, and wheaten bran are eminently useful. But there must also be a supply of green food, and in summer, grass, and in winter, boiled potatoes and other vegetables, are indispensable to the health of fowls. At the same time they must have a due proportion of flesh meat suitably cooked; and in this way pork scraps are convenient. Their drinking water must be good and clean, not icy cold in winter, nor heated by the direct rays of the sun in summer. It is dangerous to give them drink on which the sun has shed his full force in July or August.

New Jersey is also a pretty good country for poultry breeding. There are some parts of Monmouth County where the soil is easy of culture, and the presence of great supplies of marl enables the farmer to make his land exceedingly productive. On the other hand, Bergen County is more picturesque, and the lover of mountain scenery will find there much to interest his mind and lift his imagination above the monotony of common life. But in one respect poultry breeding is like virtue—it makes comparatively little difference where it is practiced. The point is to practice it with judgment and perseverance; and, as we have no doubt that our correspondents will exercise these qualities in their new business, we wish them all the success that their industry and their skill may deserve. The same intellectual gifts which make a man a great statesman or a great poet will also make him a great poultry breeder. Our final advice to these young men and to all our other readers is, pay as you go!—*New York Sun.*

M. SPRING (Belgian Academy of Sciences) concludes that the seat of the electricity of storms is not, as generally admitted, in the moist region of the atmosphere, but in the cold and dry superstratum.

Transmission of Work to a Great Distance on an Ordinary Telegraph Wire.

The Electrotechnical Committee of the Exhibition of Electricity at Munich, having requested me to repeat upon a telegraph line the experiments on the transmission of power which I had previously made over great distances, I forwarded to Munich and Miesbach the fine wire machines which I had made use of in my laboratory experiments.

The telegraph line placed at my disposal by the administration of the German telegraphic system had a length of 57 kilometers. It is of galvanized wire 4·5 millimeters in diameter, and since, as a matter of precaution, I did not think fit to make use of the earth, I requested permission to employ a return wire identical with the former. The total length of the line traversed by the current is, therefore, 114 kilometers, and its resistance, on measurement, 950 ohms. The insulation is good, but differs in nothing from that universally employed on all telegraph lines. The two machines, situate the one at Miesbach and the other at Munich, are absolutely identical, and have each a resistance of 470 ohms

The total resistance of the circuit is, therefore, close upon 1,900 ohms. In the first experiment which was made there was immediately obtained at Munich a work of 38 kilogrammeters per second (or about one half horse power), at a speed of 1,500 revolutions per minute.

The generating machine, situate at Miesbach, turned at the rate of 2,200. The two machines being identical, the proportion of the work recovered at Munich to the work expended at Miesbach was, setting aside passive resistance of every kind, $\frac{1500}{2200}$, or more than 60 per cent. The machines employed are of Gramme's "atelier" type, modified according to my calculations.

A heavy rain fell during almost the whole duration of the experiments.

The receiving machine serves at present to feed a waterfall of one meter in width and three in height, by means of a centrifugal pump.

Sparks are scarcely visible on the collectors of the two machines. The heating of the machine is scarcely appreciable after two hours' work.—*M. M. Deprez, in Comptes Rendus.*

Timber for Railroad Uses.

The moisture of the soils in the South, says the *National Car Builder*, is very destructive to woods employed as the bed for railway track, and managers have been troubled to know what is the most economical method for obviating loss resulting from this cause. Creosoting has been resorted to. Several works with large capital have been established in St. Louis for the treatment of wood by the creosote process, and in Texas the treatment has been applied along the lines as construction was pushed forward. This method, however, is considered rather too expensive. Some railway men have concluded that the ailantus and catalpa will prove to be the cheapest and most durable wood for tie and bridge timbers. One company, whose road extends chiefly over prairie lands, is having a large plantation seeded for these trees in equal proportions. Both the catalpa and ailantus are readily propagated from the seed, and bear seed pods abundantly. Another company, whose road enters Texas, is arranging to plant several hundred acres of these trees in that State. Even the Iron Mountain Company, that probably owns more heavily timbered land than any other in the country, has contracted for the cultivation of a catalpa farm near one of its stations in Missouri. On this road are catalpa ties that were laid nearly fifteen years ago and are apparently as sound as ever. It is authenticated that in southern Ohio, where one species of catalpa is indigenous, there are posts and timbers of this wood that have been in the ground a full century and yet show no signs of decay. Although the ailantus is an importation from China, still it and the catalpa seem to find in soils of Missouri, Arkansas, and Texas just what they require to thrive upon.

Weight of Western Men and Women.

During the tenth annual Exhibition of Art and Industry in Cincinnati, which closed October 7, the department of Scientific and Educational Appliances employed a clerk to record the weights of men and women visiting the exhibit of the Howe Scale Company. There were weighed 7,467 men and 14,688 women, the men averaging 154·02 pounds and the women 130·87 pounds. The averages for 20,000 men and women weighed in Boston, in 1864, were: for men 141½ pounds, for women 124½ pounds—or 12·52 pounds and 6·37 pounds less than the corresponding Western averages.

By keeping a special account of the weights of the members of excursion parties from outlying towns in Ohio, Kentucky, Indiana, and Illinois, it was possible to compare the weights of visitors from the country with the averages of the men and women forming the whole number weighed. About nine hundred excursionists in all were weighed. The visitors from Ohio averaged—men 157·38 pounds, women 133·26 pounds; from Southern Indiana and Illinois—men 158·52 pounds, women 133·55 pounds; from Kentucky—men 158·43 pounds, women 133·76 pounds. It will be noticed that the country people considerably exceeded the average weights, the men by about four pounds, the women over two and a half pounds. It would not be safe, however, to infer that the country people as a whole were thus above the average weight, since the more vigorous in their respective localities were more likely than their weaker neighbors to join in such excursions.

Correspondence.

The Copyright Act Amendment.

To the Editor of the Scientific American:

Permit me to offer a suggestion in reference to your construction of the Amendatory Copyright Act approved August 1, 1882.

Judging simply from the act and collateral legislation, and without having had the advantages of Mr. Clarke in hearing the pro and con arguments before the Patent Committee, I believe that Congress did not contemplate to depart from the interpretation of the words "engraving, cut, and print," embodied in section 3 of the "Act Relating to Patents, Trade Marks, and Copyrights," approved June 18, 1874 (18 Statutes at Large, p. 78), and that the true understanding of the act at issue is, to place emphasis on the words "subject to copyright." Although some of the articles mentioned may be protected under the act of 1874, yet it is obvious that there may be "designs for moulded decorative articles, tiles, plaques, or articles of pottery or metal *subject to copyright*," that is, whose sole purpose is use in the fine arts.

The discriminating power lodged with the Librarian of Congress under the act of 1874 is neither abridged nor altered, and designs for articles of manufacture not within the purview of the Copyright Act are to be treated under the jurisdiction of the Commissioner of Patents.

J. H. ADRIAANS.

Washington, D. C., November 15, 1882.

How to Take Portraits of Burglars.

To the Editor of the Scientific American:

We have evidently entered the age of electricity; and I offer the suggestion of a detective trap for burglars as among the important possibilities.

The burglar alarm now in use, true to its name, alarms the burglar, and he is away.

Instead of ringing the alarm, let it be set to turn on momentarily the full glare of the electric light, and at the same instant have it expose a plate in a camera all ready to take an instantaneous picture. The burglar of course will take to flight, but will leave his photograph behind. The same blaze of light which has alarmed him will awaken the sleeping inmates, who can proceed at once to the camera and secure the negative. In order, however, that the camera should be set at the right focus the alarm used should be an electric mat set in a certain place on the floor, that spot being covered by the focus of the camera.

In case of banks and safety deposit companies, the electric mats should be in front of the iron safes.

E. S. BROWN.

Rutherford, N. J.

Milk and Oil in Disease.

To the Editor of the Scientific American:

I notice in your paper of the 14th of October an article taken from the statements of Dr. Benj. Clark and Dr. Alexander Yale in favor of the use of milk as a diet in dysentery and typhoid fever. They give no dates as to when they commenced to use it. I am now in my seventy-fifth year, and have witnessed several epidemics of dysentery, typhoid, scarlet, and relapsing fevers, smallpox, measles, etc., and have used milk in every case coming under my care for near forty years, in every stage of the disease. I will not say it is a cure, for I do not believe in the so-called "cures" and "specifics." Milk is the natural food of all mammalians. It not only sustains life, but promotes the growth of every part of the system. No other article contains all those ingredients. It is the recuperative power of nature that performs the cure; and he who studies how to assist it by sustaining the system is the best physician, and milk is one of the best agents that can be used. In dysentery I prefer fresh buttermilk, and all the patient wants is perfect rest, and discard all irritating cathartics and purgatives. Mercury in any of its preparations is poison in dysentery or scarlet fever, and the physician who gives them will never be very successful. If his patient recovers it will be despite his treatment. I will add that in smallpox and scarlet fever I anoint the patient from head to feet with olive oil by means of a badger brush, and repeat as often as it disappears, thereby allaying the heat, keeping open the pores of the skin, producing quietude, preventing congestion of the capillary circulation, and obviating the necessity of anodynes. I have practiced the greasing for thirty-five years, and was sneered at by my medical brethren for it and the milk treatment. Now, I believe, it is in general use with the best results.

W. W. TOWNSEND, M.D.

Philadelphia, Pa., November, 1882.

The Coming Transit of Venus.

BY PROF. C. A. YOUNG.

The planet Venus, which all the summer has been conspicuous in the evening sky, reached her greatest distance from the sun upon the 26th of September, and, returning upon her course, is now fast approaching the sun again. On the 6th of December she will pass across the southern portion of the solar disk as a small, black spot, easily visible to the naked eye. The transit, as it is called, will begin in the neighborhood of Boston at about nine o'clock, and will end at about half-past three.

The interest of the event lies not very much in the phenomena presented, but mainly in the fact that transits of Venus are exceedingly rare, and that until recently they were supposed to furnish the most accurate data for determining the distance of the sun. The only transits thus far observed occurred in 1639, in 1761, and 1769, and a few years ago, in 1874. The two next transits, after that of next December, will not take place until the years 2005 and 2013.

It is obvious, of course, that when Venus is between the earth and sun she will look like a black dot upon the sun, and, moreover, that observers at different stations on the earth will see this dot in slightly different positions on the disk. Now, without going into details or explanations as to the why and how, it is enough for our present purpose to say that if observers at widely separated stations of known geographical position will furnish accurate data which determine the precise places on the solar disk occupied by the planet at some definite instant, then we can also compute easily the parallax and distance of the sun. But—and here is trouble—if the data are not extremely accurate, our final result will be widely incorrect. Its value all turns upon the degree of accuracy attainable in the observations.

The observational data may be of three kinds: they may consist of observations of the precise moment at which the disk of the planet touches the disk of the sun—"contacts," technically so called; or of measurements, made during the transit (with a heliometer), of the distance between the planet and the sun's disk; or, finally, of photographic pictures taken at known instants. These pictures are "measured up" afterward, and show autographically, so to speak, where the planet was each moment.

When Halley, about 1680, secured the attention of astronomers to the value of these transits, he supposed, and so did every one, that the moment of contact could be observed with an error not to exceed a second or two. Were this so, the observations of a single transit, by a reasonable number of observers, ought to have settled the parallax of the sun within one one-thousandth of its value, and determined its distance within 100,000 miles.

In fact, however, it appears that from the whole body of contact observations made in 1761 and 1769, more than a hundred in number, nothing further can be certainly concluded than that the sun's parallax lies somewhere between 8·6″ and 8·9″; its distance between ninety-five and ninety-two millions of miles. It was hoped that a century of improvement in telescopes would have made this sort of observation more accurate by this time. But the gain, though real, has been comparatively small. From the contact observations of the English parties in 1874 the most eminent calculators deduce results ranging from 8·76″ to 8·88″, and the difference means a million and a quarter miles in the sun's distance.

The discrepancies are due to slight differences of interpretation put by the computers upon the language used by the observers in describing what they saw; the question being which one precisely of the different phases of the phenomena was really that of the true contact.

The atmosphere of the planet, the so-called "diffraction," and the optical imperfections of the telescope and eye, all conspire to produce uncertainty. The writer himself observed the transit of 1874, and most vividly remembers how gradual, elusive, and perplexing were the phenomena, which endured for at least a minute at each internal contact, and made it quite impossible to fix upon any single second as the true one. While this is true, however, it may perhaps still be possible for practiced observers, with similar telescopes, to come to some reasonably close agreement as to the instants of certain phases in the slow progress of the event.

The method of heliometric measures was employed by the German parties in 1874; but no results of their work have yet been published, so that it is hitherto impossible to compare its accuracy with that of the other methods.

Photography was pretty thoroughly tried at the last transit by nearly all the parties, and in several different ways. The English and Germans used telescopes mounted in the ordinary way, while the French and Americans used long stationary horizontal telescopes, and directed the light through the lens by means of a mirror. So far as can be judged at present, however, these photographic operations were mostly unsuccessful. The pictures were not found to permit of sufficiently accurate measurement to be of any use, and the commission of European astronomers which sat in Paris last spring to discuss the observation of the coming transit did not recommend any further use of photography.

The American photographs, however, turned out better, as did those taken by one of the Russian parties (at Port Possiet); indeed, to say the least, their results seem to be quite as much to be depended on as those of the contact observations. In this state of the case the American astronomers have felt that, all things considered, the photographic apparatus which was prepared for the transit of 1874 should be used again, and a fresh and most careful attempt should be made to "run the thing for all it is worth," as a college boy would say. Near the close of the last session of Congress an appropriation of $75,000 was accordingly made for the transit, and eight parties are to be put into the field—four in the Southern hemisphere, and four in the United States. Professor Newcomb's party goes to the Cape of Good Hope; Professor Boss to Santiago, Chili; Lieutenant Very to Santa Cruz, Patagonia; and Assistant Smith, of the Coast and Geodetic Survey, to New Zealand. In the United States, Assistant Davidson will observe at Fort Thorn, New Mexico; and the Naval Observatory professors (Hall, Harkness, and Eastman) will observe respectively at San Antonio, (Texas), Washington, and Cedar Keys (Florida).

The different observatories throughout the country will also co-operate as far as their means will allow. Princeton will photograph the transit with an apparatus precisely similar to that of the Government parties, and perhaps Harvard may do the same. Yale will use her new heliometer (the only one in the country) to make observations on the German plan. All possessors of telescopes will of course observe the contacts, and on the day of the transit Washington time will be telegraphed to every observer who desires it. A few foreign parties will observe in the United States, especially two German parties—one at Aiken, S. C., the other at Hartford, Conn. For the most part, however, the European astronomers go to the Southern hemisphere, leaving "America for the Americans."

It is not to be disguised that at present it looks as if more accurate determinations of the solar parallax are to be got by other means than by transit observations; as if this old method would prove to be inferior to newer ones, and must finally be superseded. At the same time, this is not quite certain yet; and although some of the leading astronomers have been rather disposed to give the event the "go by," still the prevailing sentiment has been overwhelmingly in favor of making all that is possible out of an opportunity which will not recur for more than a hundred years.—*Boston Journal of Chemistry.*

Action of Hydrated Oxide of Copper on Sugars.

A German with the suggestive name of Hönig (Honey) has been studying sugars in connection with Habermann, and their results are published in a Vienna journal.

Hydrated oxide of copper was prepared by Boettger's method, and in its perfectly pure state was found to be far more permanent than the ordinary hydrate. It would keep for months under water in closed bottles without suffering any change.

The experiments were performed by putting an aqueous solution of the sugar in a flask with a return cooler, the hydrated oxide of copper added, and then gently boiled; after each reduction of the oxide a fresh quantity was added, and so on until the reduction was much slower, which required unequal times for different sugars.

Cane Sugar.—Ordinary white rock candy of the stores was employed in this experiment. A perceptible reduction of the hydrate did not begin until the boiling had continued several hours and there began to be an evolution of carbonic acid. The reduction, which went on rather largely at first, was much more rapid after the addition of a second and third portion of hydrates. The evolution of carbonic acid became more lively and then subsequently slackened considerably. There is no doubt that in the early part of the process the cane sugar was inverted, when the rest of the process can be readily understood from what follows. The concentration of the sugar solution seemed to exert no special influence on the whole operation.

Invert Sugar.—White rock candy was dissolved in water and inverted by boiling with about two per cent of sulphuric acid. In some cases the sulphuric acid was removed and then hydrated oxide of copper added, and in other cases the latter was added without previously precipitating the acid. The reduction of the hydrate began a short time after the liquid began to boil, and was completed much sooner in an alkaline than in a neutral solution.

Grape Sugar.—The sugar used was a pure preparation made by the Schwarz-Neubauer process. In neutral solutions the reduction was quite slow to begin and went on slowly. Here, too, an evolution of carbonic acid began simultaneously with the reduction. But in solutions to which caustic baryta and potassic hydrate had been added, the reduction began as soon as the hydrated oxide of copper was introduced into the warm solution, and it also proceeded much more rapidly.

Fruit Sugar.—This was prepared from inulin by the well-known method. In neutral solutions the reduction of the copper compound began much sooner than in dextrose solution; scarcely any further increase of activity was noticeable in the alkaline solutions of fruit sugar. In alkaline solution it began at the ordinary temperature with considerable rapidity and ran on to completion.

Boettger's method, referred to above, consists in adding ammonia to a boiling solution of copper sulphate until the precipitate begins to turn blue; this granular crystalline basic salt is then treated with moderately dilute potash or soda. It forms a beautiful sky blue hydrate, easy to wash and dry, and keeps a long time even when moist.

Tea and Coffee Extracts.

An aqueous extract of tea, coffee, cocoa, or ginger, is made by boiling it for fifteen minutes in water containing sulphate of lime in solution, then cooling to 60°, when a solution of tannic acid, previously boiled till nearly devoid of smell, is added. A precipitate occurs and is filtered out. It is then left to stand for a day, and an aqueous gelatine solution of three or four grains to the ounce of water is added in quantity nearly sufficient to precipitate all the tannic acid. The liquor still containing a little tannic acid is strained and bottled.

"PRESENT evidence," says Prof. Owen, in *Longman's Magazine*, "concurs in concluding that the modes of life and grades of thought of the men who have left evidences of their existence at the earliest periods, hitherto discovered and determined, were such as are now observable in 'savages,' or the human races which are commonly so called."

NEW FIRE ESCAPE.

The necessity of a permanent and efficient fire escape as a fixture on all buildings not absolutely fireproof throughout, is manifested at every conflagration in cities or large towns or in high isolated buildings, and authorities are recognizing the fact that the only fire escapes thoroughly reliable under all circumstances are those of the class applicable to buildings as permanent fixtures.

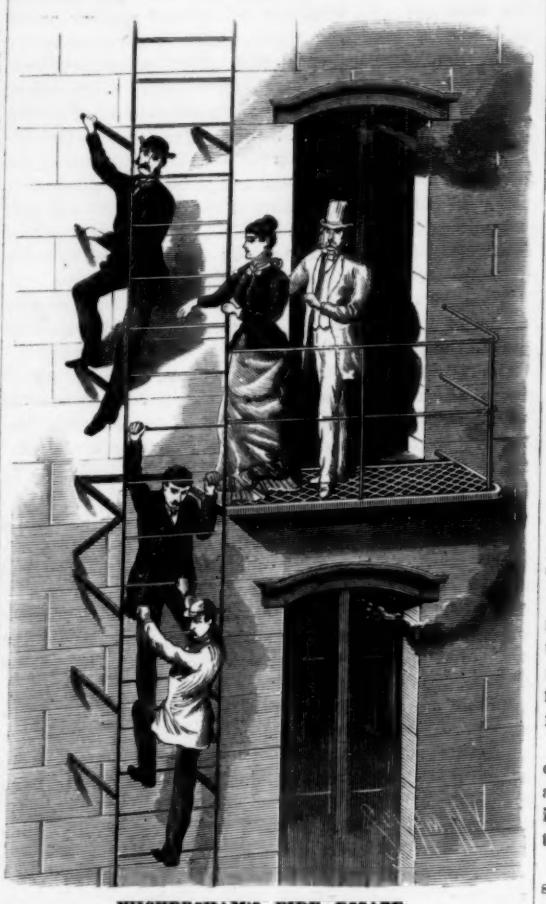
We illustrate a fire escape which is probably the simplest, handiest, and safest of this class. It is composed of a vertical iron ladder placed about 18 inches from the wall of the building, supported by side stays. One end of the stay is secured to the building, the other end of the stay being secured to the ladder. Persons can descend on the inside of the ladder with their backs supported by the wall, allowing the free use of their hands, while the side stays prevent them from falling sidewise.

This simple fire escape enables more persons to descend in a given time than any other fire escape now in use. They may descend on the inside of the ladder, on the outside of the ladder, and on the side stays—allowing three persons to escape together.

Balconies are erected on either side of the ladder, at the windows, ready for escape. The floors of the balconies are made of wire mesh work, to prevent the feet of the person from slipping and to prevent the accumulation of ice and snow.

We are informed that this fire escape has been approved by the fire commissioners. It certainly requires very little examination to enable one to see that nothing could be simpler, safer, or cheaper. Many of them have been applied to prominent buildings in Philadelphia, where it is found to fulfill every requirement and is found to not mar the appearance of the buildings to which it is applied.

The invention has been patented by Mr. J. B. Wickersham, of 505 Cherry street, Philadelphia, Pa.



WICKERSHAM'S FIRE ESCAPE.

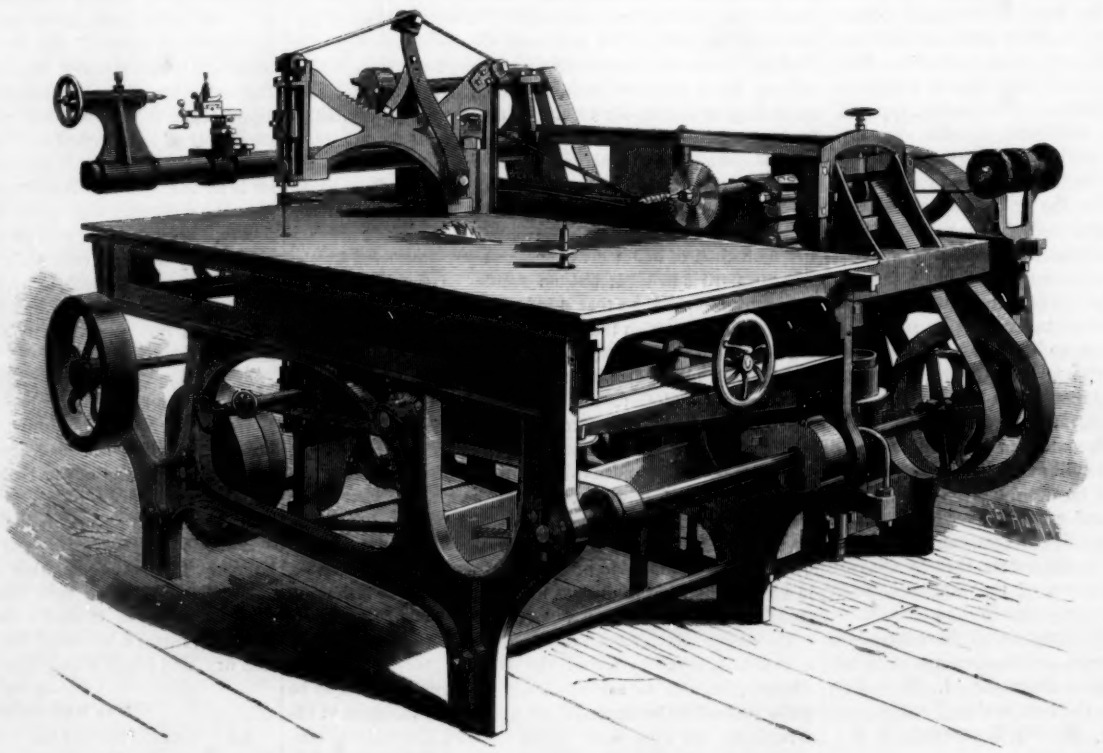
NEW WOOD-WORKING MACHINE.

Among the new and useful inventions we find R. H. Andrews' Complete Wood-Worker, which is shown in the annexed illustration. This machine is a group of general tools, and cannot be called a combination, as all of the eight machines work independently of each other, and are thrown into and out of power by shifting belts and other appliances arranged for that purpose. The machine is light running, owing to the entire absence of cog gear, and the inventor claims that there is no other machine within the reach of the mechanic of moderate means and limited business facilities that will do the same amount and variety of work, considering the amount of floor room required to operate it, and the price at which it can be bought. The cross-cut circular is the ordinary railway saw (saw and table partly shown), with miter attachment, operated through the table under the lathe head. The mortiser, which is partly shown in the engraving, is operated above this table and under the lathe head, a guard or back support for the work being bolted on to the table. The chisel bar can be raised, lowered, and reversed without stopping the machine.

The lathe has fast and slow speed for wood and metal turning, and is similar to the ordinary lathe, except that the bed, when not in use, is pushed back through the support of the lathe head. The lathe mandrel is hollow to admit of a dowel cutter attachment. The lathe as shown in the illustration is rigged for metal turning. The gig saw has no springs, getting its tension by raising the center pulley or ratchet arm or the crane. The crane is pivoted at the back, and when not in use can be swung quarter round out of the way. The circular rip saw is fast in its frame, and when not in use can be lowered below the table by a screw at the end of the machine. This frame carries a ten-inch saw, but when raised will take a sixteen-inch saw for special work. The upright shaper or moulder spindle is screwed on the upright shaft, and can be removed when not in use. The shaper is reversible and gets its lines for work by adjusting the table. The mandrel for boring bit is also used for a butting up saw for work that is too wide for the regular cross-cut.

The tenon cutter gets its lower line for work from the table, upon which is placed a sliding guard or work holder. The upper cutter is put in line by a screw, and is held in place by set bolts. The table is on double inclines, and can be raised or lowered at either end of the machine, and stopped at any point up to four inches. The emery wheels for grinding tools are a simple attachment for convenience. The attachments for sawing dovetails, carving, and a rotary planer for facing up wide stuff, are not shown.

Further information may be obtained by addressing the patentee, Mr. R. H. Andrews, of Washington, D. C.; also see advertisement in another column.



ANDREWS' WOOD-WORKER.

The Disposal of Sewage in European Cities.

In an elaborate report on the sewerage systems of European cities, with special reference to the needs of Philadelphia, Mr. Rudolph Hering notes that London has a complete system of valley line sewers, which follow closely the natural flow lines of water from the surface. In addition it has main drainage works, a system of intercepting sewers which prevents the sewage from entering the Thames, and takes it to a point ten miles below the city and there discharges it into the river at outgoing tides. A portion of the sewage thus intercepted flows off entirely by gravity.

A greater part requires to be pumped; a small portion is even lifted twice before it reaches the outfall. Although the main drainage sewers are capable of taking some rain water, most of it reaches the river directly through the valley line sewers into which the intercepting sewers discharge their surplus during storms.

The general alignment in Paris is partially an intercepting and partially a valley line system, owing to the topography. The sewage is discharged into the river below the city. The irrigation fields, now in preparation, receive about one-fifth of the whole amount. A small portion reaches them by gravity, the rest is lifted nearly thirty feet. The sewage from the higher grounds is intercepted so that it will not flood the lower ones during heavy storms. The sewers along the banks of the Seine are also intercepting.

Berlin has a peculiar system, due to its flat position and the necessity for purifying the entire sewage. The latter is to be collected at twelve different points, to which the sewers converge radially, and from each of which it will be pumped directly to the farms.

Vienna has a natural valley line system, except two intercepting sewers, along the banks of the Wien Creek flowing through the city.

In Liverpool, the sewers partly follow the natural slopes, and partly cross them where it is necessary to intercept the storm water. The sewers finally discharge directly into the Mersey, in front of the city.

In Hamburg, intercepting sewers predominate on account of the necessity of keeping the sewers out of the numerous canals and the Alster lakes. The sewers discharge finally into the Elbe, in front of the city.

In Frankfort, the low grounds near the river made an intercepting system preferable, and it has been carried out in a consistent manner over the whole city. Rain water overflows, however, lead to the river directly from many points. The intercepting sewers discharge below the city.

From a study of the alignments in these cities, it will be noticed that the system of interception is made use of, partially to prevent an undue accumulation of rain water at the foot of slopes, partially to prevent sewage or rain water from flooding low districts, and partially to prevent sewage from flowing into the rivers in front of the cities.

A more detailed study will further reveal that an early concentration of sewage into a few larger sewers is preferable to keeping it more uniformly distributed over the area in a number of smaller ones, and a calculation will show the economy of this.

Finally, it will be clear that the manner of disposal of the sewage depends on the body of water flowing by or near the city. The Thames is capable of receiving the London sewage without injurious effects. The Seine, being much smaller and very far from the sea, is objectionably polluted, and the sewage is therefore to be purified on the sandy plains of Gennevilliers below the city.

Vienna discharges its sewage at present into the Danube canal, but is preparing to lead it into the Danube itself, the capacity of which is sufficiently large to prevent any pollution. Berlin has but a small river flowing by it, which makes purification of all the sewage a necessity.

Hamburg and Liverpool are situated along large bodies of water, and discharge into them without objection.

Frankfort discharges into the Main, but steps are now being taken to purify the sewage, as the danger of pollution by the rapidly growing city is fast approaching.

Commerce on the Congo.

November 12, 1882, is likely to prove an important date in the commercial history of the Congo country, Central Africa. On that day the steamer Harkaway sailed from Antwerp for the Congo River, carrying an assortment of goods for the establishment of trade with the natives of the interior by the International Association, whose agent is Henry M. Stanley. The steamer carried also a number of sheep for acclimation and a selection of European cereals. Mr. Stanley, who is in Nice recruiting his health, will return to Africa early in 1883.

MALLEABLE BRASS.—A German periodical is responsible for the following method of making malleable brass: Thirty-three parts of copper and twenty-five of zinc are alloyed, the copper being first put into the crucible, which is loosely covered. As soon as the copper is melted, zinc, purified by sulphur, is added. The alloy is then cast into moulding sand in the shape of bars.

THE GREAT TUMBLE WEED OF THE PRAIRIES.

(*Cycloloma platyphyllum.*)

JOHN R. COXELL.

During his wanderings in the great West, Mr. Daniel C. Beard, the well-known artist and naturalist, came upon a curious vegetable growth known popularly as the tumble weed and scientifically as *Cycloloma platyphyllum*. At the time he was unable to secure a specimen of the weed, but lately, through the kindness of Mr. Henry Worrall, of the Department of Agriculture, Topeka, Kansas, he was enabled to obtain photographs of some of the finest specimens of the great weed preserved in the buildings of the department. The genial gentleman referred to was even courteous enough to permit himself to be used as a medium for comparison.

A startling story is told by the veracious Western man of a party of English tourists who were out on the plains on a shooting excursion. They had been out the greater part of the day without meeting with any game, and were repeating for the hundredth time that their luck was "beastly," when one of them noticed a large animal some distance away, which was approaching them in a leisurely but apparently inquisitive manner, for it paused occasionally as if to study them.

THE GREAT TUMBLE WEED OF THE PRAIRIES.

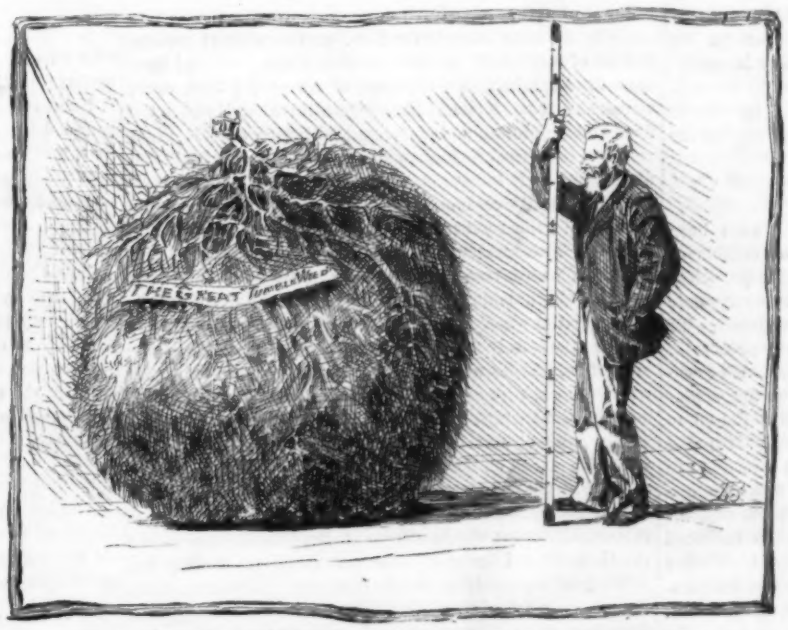
The Englishman pointed the animal out to his companions, and they agreed among themselves that it must be a bison, though its movements were different from those of any four-legged creature they had ever seen before. However, they did not make much of that fact, as a breeze that had sprung up had raised considerable dust and made it impossible to see very clearly.

It was so evident that the bison—if such it were—was attracted by curiosity, that one of the hunters determined to beguile it by a device he had heard spoken of as very successful with the antelope. Accordingly he lay upon his back and kicked his heels in the air, while the crack shot of the party prepared to shoot when the proper time came. The creature was so far away and approached so slowly that the decoy grew tired and had to be relieved. It was so evident that they were drawing the creature toward them, however, that each in turn cheerfully and even enthusiastically kicked himself tired.

The breeze had grown momentarily stronger, and though it was fortunately blowing toward them, it created so much dust that it was not easy to get good aim. However, the animal had increased its pace, and with an occasional bound into the air was rapidly approaching them. It was impossible to make out which was his head and which his side, so the appointed hunter, with as careful aim as the strange character of the game rendered possible, fired.

The animal had been hit, for they could see the fur fly, but it paid no attention to the shot, unless it was to bound into the air and increase its speed so much that in a few moments it was near enough to be easily distinguished. It was an uncouth monster of huge proportions, and progressed not in the usual way, but by a series of prodigious leaps. The hunters were greatly startled by the appearance of this unknown animal, but they realized that they must lose no time in shooting if they hoped to keep it from them. They all fired at once; but whether wounded or not, the monster only sped the swifter.

They paused in amazement for a moment, but were roused into sudden activity when one of their number shouted that a whole herd of the monsters was upon them. True enough all over the plain they came with frightful rapidity, making such tremendous leaps that there seemed as many in the air as on the ground. The hunters lingered no longer, but with the haste of terror threw everything from them, and ran to such purpose that they distanced their pursuers and found shelter late in the afternoon in the town from which they had started. Their story caused a great sensation, but not of precisely the kind they had expected. The next morning it was found that the tourists had left for San Francisco.



THE GREAT TUMBLE WEED OF THE PRAIRIES.

The story, if not true, at least serves well to illustrate the peculiar habit of the great tumble weed. This strange growth, which belongs to the pig weed family, is very abundant in the great Arkansas valley, and varies in size from the huge specimen shown in the illustration to one foot or less in diameter. It grows upon a disproportionately small stem, which, however, is of sufficient stoutness to sustain the mass until it has ripened and dried, when a slight gust of wind will suffice to blow it over and snap the brittle standard.

It now rolls over and over at every puff of wind, and being both light and elastic will perform a series of bounds over any impeding bowlders or bushes. In a high wind the fantastic spectacle produced by a number of these balls of varying sizes can easily be imagined. And as the English tourist with his store of wonder adjectives and odd expletives is the stock butt of the Western man, it is not strange that he should be brought into service to illustrate the most striking feature of the tumble weed.

Aside from its spectacular phase, this habit of the tumble weed may be viewed in an even more interesting light. Man sees everything from the standpoint of utility to himself, and he may not comprehend the necessity for the existence of the tumble weed at all; but in every created thing there seems to be inherent a continual effort to propagate its kind. Examples of the working of this spirit cannot be necessary, for even in the cities, the trees—the ailantus, for example, with its winged seeds—give evidence of it. The fantastic and seemingly senseless whirling, rolling, and bounding of the tumble weed, when understood, tell the story of a unique plan for distributing seed.

The Plumbers in Luck.

The sanitary boards in cities and towns, a class of persons denominating themselves sanitary engineers, and a few weekly and monthly journals devoted ostensibly to sanitary subjects but really conducted in the interest of plumbers and dealers in plumbers' supplies, seem to be creating unnecessary alarm in the public mind by their frightful reports of defective plumbing, and the consequent danger to health. There is no doubt but much good will result from the awakened interest in the subject, but there is a likelihood that a great many will go to great expense, and subject themselves to a great deal of annoyance, in having their plumbing arrangements changed when there is no real necessity for it. A recent number of the *Builder and Wood Worker*, referring to sewer gas, while admitting its poisonous qualities, and that it spreads disease and death in our dwellings, does not believe that this deadly agent is as rampant as some writers would have us believe. "In fact," it says, "we are confident that half the ailments attributed to this source do not result from it at all, but from other causes. While we admit that the evil is great, and that thousands suffer from the effects, we are disposed to the opinion that the terms 'sewer gas' and 'malaria' are employed to cover the inability of the M.D. to properly diagnose his patient's complaint, and that attributing the ailment to the mysterious agency of this subtile gas serves the dual purpose of giving an air of smartness to the physician and covers his retreat from a position which he is unable to cope with. The presence of sewer gas may always be detected in an office, room, or bath if the woodwork has been painted with white lead, as the sulphureted hydrogen, or sewer gas proper, attacks the lead and turns it black almost at once. When painted work in a room turns black or gets a leaden color, then beware, for a deadly foe is at hand, and the sooner you annihilate it the better for your peace of mind. A little watching will soon convince you whether sewer gas is present or no. If it is, discoloration of painted work will rapidly take place and hoist the signal of danger; if not, then the paint will retain its original color, subject only to the darkening process which comes of usage and exposure."

The Pestered Man of Earth.

As if the actual suffering of mankind from the various diseases common to the lot of all, was not sufficient, the *Hahnemannian Monthly*, of Philadelphia, enumerates the following possible cause for many mysterious complaints which baffle the skill of the most experienced physicians to cure, and enough in number to frighten a well person into a nervous fever: Commencing at the mouth, the virulence of human saliva seems to have been proved. It is supposed to be due to micrococci. The human mouth is a culture chamber, which is maintained at a constant temperature, and is furnished with a constant supply of pabulum, namely, saliva. These circumstances are highly favorable to the sustenance and multiplication of the micrococcus. If, now, it is asked why every man does not suffer from auto-inoculation, it may be answered that micrococci may kill an herbivorous animal, a rabbit for instance; but cannot destroy a carnivorous or omnivorous animal as man. (See Philadelphia *Medical Times*, September 9, 1882.) Most earnestly do we urge vegetarians to take timely warning! But what is to become of the genus *homo*, anyhow? Vibriones tickle his nose into hay fever, the Bacillus typhosus gnaws at his bowels, the micrococcus diphtheriæ swells up his throat or clogs his larynx with fatal croup, sarcinæ invade his stomach, and micrococci envenom his saliva. If he eats a bunch of grapes, he must needs crunch the parasitic saccharomyces adhering to the skins; and if he inadvertently exposes the contents of his pantry to the open air, a blue green mould from the Penicillium glaucum spreads itself over the best preserves; bubbles line the glass jars, and wriggling organisms and motionless forms looking like beads on a string, sour his milk. The greed of the yeast plant for oxygen is the cause of the raising of his bread, and the same craving on the part of the Mycoderma vini, supplies him with wine. But if he does not carefully watch these results of fermentation, mould gathers on one, and the other falls a victim to the spores of the viscous ferment and becomes thick, ropy, and unpalatable.

If he indulges in pork, trichinæ nestle cosily in his tissues, or the Cysticercus cellulosus develops into twenty feet of tænia to the discomfort of his alimentary canal. In infancy and childhood, thread worms and lumbricoides disturb his sleep and torture him with colicky pains. Disease germs expose him to whooping cough and mumps, and threaten him with a long line of exanthemata; and when, the gauntlet run, he comes into youth, that fell destroyer, consumption, fed, if Koch is to be believed, by bacilli, leaves him but six out of seven chances of ever reaching the period of maturity.

If, by good fortune, he escapes this danger, others meet him at every step. Through the parsimony and dishonesty of city officials, streets are filthy and sewers are imperfect. If he flies to the country, perchance a dry summer and an open winter permit the generation of miasmata. And even if he seeks the salubrious atmosphere of a sea resort, defective sanitation poisons his bedroom or permits the discharges from a drain to empty a few yards from his bathing place.

And finally, when he falls a victim to disease fungi or, happily escaping them, dies of good old age, his mortal remains are no sooner consigned to the grave than a host of maggots and kindred scavengers complete the work of devastation, and thus does the man of earth become converted into the numerous bodies of his numerous destroyers.

W. H. Mallory.

Colonel W. H. Mallory, inventor of the screw steering propeller which bears his name, died in Bridgeport, Conn., November 8. He was born in 1840, was graduated at Trinity College, Hartford, Conn., in 1860, and earned his military title in active service with Duryea's famous Zouaves. Besides the steering propeller, which is employed on the United States torpedo ram Alarm, Colonel Mallory made several inventions which brought him considerable profit; and at the time of his death was engaged in perfecting a torpedo.

How Cable Messages are Received.

Until the forepart of November the French cable, having its terminus at North Eastham, Mass., employed the flash system of signaling. Now the cable is worked duplex on the Sterns system, using an automatic recorder by which the messages are received in ink on a narrow strip of paper.

By the system which has been displaced the messages were spelled out by flashing a ray of light back and forth across a standard line, the right and left flashes corresponding with the dots and dashes of the ordinary telegraphic alphabet.

In this system the light is flashed by reflection from an extremely light mirror which is turned to right and left by the opposing influences of positive and negative impulses. This system has the advantage of being operated with very slight electric impulses, but also the disadvantage of leaving no permanent record.

To secure the latter very important end the recording instrument has been adopted. The press dispatch announcing the change states that in the new recorder the ink is discharged by the agency of electricity and "not by capillary attraction as in other cable recorders." This statement is incorrect, electricity being now similarly employed in the recording instruments used at Heart's Content, the Newfoundland station of the Anglo American Company's cables.

A recent visitor to Heart's Content describes as follows the method of receiving messages at that point. The recorder is a horseshoe magnet, electrified by the usual circles of fine wire, and attracting a small metallic coil. The coil is hung between the magnetic poles, and by a light lever and a thread almost as fine as the strand of a cobweb, is connected with a delicate siphon hung in a little reservoir of ink. The ink is electrified, so as to produce a repulsion of the particles, making it flow more readily through the siphon, which outside is about the size of a darning needle, and the interior tube scarcely larger than a hair. The lower end of the siphon rests against a paper tape playing perpendicularly through rollers. The whole machine is almost of gossamer fineness and flexibility, so as to minimize the electric strain necessary for working the cable.

Let us imagine now that a coming message has been signaled from far across the ocean at Valentia. The operator at first opens the simple machinery that works the brass rollers. On the center of the tape, as it passes between the rollers, the siphon at first marks only a straight line. Suddenly the line swerves to the right or left. The message has started, and the end of the siphon has begun its record. Worked by two keys, and positively or negatively electrified, the coil swings the siphon point now to one side, now to the other, along the tape. Responsive to the trained hand of the operator, the filament of ink marks out one notch, two notches, three notches; then suddenly it may be a high elevation or depression until the delicate line traced on the tape looks like the tiny outline of a mountain range. But it is a range whose every hilltop, peak, and valley means an alphabetical symbol to the telegrapher's eye. The recorder is the invention of the famous electrician Sir William Thomson. How delicate an interpreter it is may be inferred from the fact that ten jars work 1,800 miles of cable between Valentia and Heart's Content, while twenty-five jars of the same electric power would be needed to work 350 miles of land wire; in other words, the recorder is more than twelve times as efficient for its purpose as the ordinary Morse instrument. The recorder traces its characters on the tape about as fast as a slow penman copies a letter. Besides its delicacy of work, the recorder, as its name imports, has the merit of leaving the record of the message.

Dyeing Leather.

In the glove trade the leather has hitherto always been dyed by brushing on the dyes by hand. The defects of this method are: its slowness, the occurrence of large, soiled edges on the fleshy side, and, notwithstanding every care being taken, the uneven character of the dye produced. To avoid these, Joseph Kristen, of Brünn, has a process in which even dyeing is obtained by the application of centrifugal force. The skin to be dyed is fixed on the center of a horizontally rotating disk; the color is also fed on to the center, and by the rapid revolution of the disk, is spread equally over the whole surface. The color is forced on to the disk by means of a pump, or it merely flows from a reservoir standing at a higher level. The excess of color driven off at the edges of the revolving disk is collected and used over again, until the skin is fully dyed. To dye one skin by this method takes from ten to fifteen minutes. A single color pump may serve for at least five machines, which would require only one attendant, so that, by the above arrangement, one man could, in twelve hours, easily dye 150 skins, possessing great evenness of dye and free from spotting.

Large Sailing Ships.

The Cyrus Wakefield, one of a number of large wooden ships lately built in Maine, was in this port recently. The vessel is handsome as well as large—about 265 feet long over all; 44 feet beam; draught when loaded, about 24 feet; and capacity for about 3,000 tons dead weight. She is 2,013 tons register.

A still larger ship is now in process of building in Maine. It is to be 2,400 tons register. The largest sailing vessel afloat is the American ship Three Brothers, formerly the steamer Vanderbilt. She is 2,985 tons, 320 feet long, and 48 feet beam.

Fresh Water from the Sea.

Owing to the peculiar nature of the fresh water supply in Egypt, and to the fact that it lay practically at the mercy of the enemy, extensive preparations had to be made for the condensing of salt water, in order that there might be no danger of a serious want of this necessity of life. The London *Times* gives a memorandum which was drawn up by an officer of the fleet on the subject of the arrangements which were made at Alexandria for condensing and supplying the condensed water, from which we make the following abstract:

It was decided to fit the large premises of the Alexandria Cotton Pressing Company, at Gabari, as the principal condensing establishment, with another in the Arsenal, utilizing there the boilers of some engines which had been employed for pumping out a dock now filled with water and no longer used. The Gabari establishment was very conveniently situated as all the troops landed there, and close round it were grouped barracks, the headquarters of the Transport, the Commissariat, and Military Hospital. It was about 300 yards from the harbor, and about 35 feet above the water level. The premises were very large, with broad streets on two sides and a courtyard. It was two stories high, and had a convenient fitting shop in the building. There were five large boilers in excellent condition. To enable these premises to be adapted to their new purpose the following work was done: Four out of the five boilers were disconnected from the engines, and pipes were fitted to conduct the steam to two iron reservoirs already on the premises, which were fitted as condensers. The fifth boiler was reserved for working the lathes, etc., in the fitting shop, and the auxiliary engines, feeds, etc. These condensers were iron tanks of about ten tons capacity. In one of these was placed three coils of 1-inch iron piping, 600 ft. in total length; in the other two coils of 2-inch piping, total length 240 ft. The circulating water was thrown up from the harbor by a 4-inch centrifugal pump worked by an 8-horse power portable driving engine, 2½-inch iron gas piping being used. On trial it was found that owing to the length of piping the centrifugal was unable to throw a sufficient quantity of water to the required height on upper floor of the building. It was accordingly led into a tank placed in a cellar, and a donkey engine, already there, was utilized to throw the water the required height. This was found to answer, a sufficient quantity of circulating water (about 40 tons an hour) being obtained; and the condensers were able to supply 30 and 40 tons of water respectively per diem, the larger piping giving the best results. It was found, however, that the boilers were capable of generating a larger quantity of steam, and accordingly, a third condenser was built of wood by the carpenters of the fleet, and in it were placed two coils of 2-inch piping of a total length of 416 ft. An independent supply of circulating water was obtained by means of a 6-inch centrifugal pump driven by an 8-horse power portable engine and 4-inch iron piping. An ample supply of circulating water was thus obtained from near the locks at the entrance of the canal, a distance of 220 yards. This condenser was never used to its utmost capacity, which was certainly at least 60 tons per diem (or 360 barrels, or 1,500 gallons).

For storing the water three large open wooden tanks were made by the carpenters of the fleet, each capable of holding 12 tons of water and ten old wooded tanks that had been used in Abyssinia, of a capacity of about 4½ tons each, were sent from Malta. These were raised well above the floor of the building and connected with each other. Pipes were led from the condensers along the floor overhead and discharged their water into a zinc-lined box thickly perforated and placed over one of the open tanks; the water while falling into the reservoir was thus broken up, cooled, and aerated. These reservoirs (containing an aggregate of about 80 tons of water) were connected by pipes with two large iron troughs outside the building, placed high enough to discharge the water into the military water carts, and were fitted so that twelve or thirteen carts could be filled at the same time. Pipes were also led from the reservoir to fill wooden horse troughs, placed round the courtyard before mentioned, at which about forty horses could be watered together. Some iron tanks of a total capacity of 22 tons were also placed on the ground floor in immediate communication with the condensers, from which the men were to draw their drinking, cooking, etc., water in kettles. The work in this establishment was in charge of Mr. Welch, engineer of the Helicon, and the great success attained was largely due to his great zeal, ability, and intelligence. It was an exceptionally economical condenser, nine tons of water being made for a ton of coal, without including the driving engines (including everything, about eight tons of water was made per ton of coals), or eight pounds of fresh water per pound of fuel. An entirely different plan was carried out at the arsenal dock condenser. In this case the boilers were about twenty-five yards from the dock which was used as a condenser, the steam being conveyed thither from the boilers by three 3-inch iron pipes (a single large pipe would have been better probably, but it could not at the time be obtained). Two donkeys had to be fitted for feeding the boilers, each having a 3½-inch plunger and 7-inch stroke. The arrangements for condensing the steam were as follows: On reaching the dock the steam was again subdivided, three 1½-inch pipes being fitted to take the steam from each of the three main steam pipes. These smaller pipes were bent, and laid about, on an average, five feet under water along dock and raised at the other end so as to discharge their water into an iron receiving tank placed at the side of the dock, the total length of piping being 900 ft. This receiving tank was placed in connection with five other iron tanks, fitted with cocks for drawing off the water and connected with large iron troughs for filling carts ten at a time, as at Gabari, an overflow pipe being led into an iron lighter capable of holding about 120 tons of water, and fitted as a tank. At first three coils instead of nine separate pipes were tried, but the result was disappointing. Only about 45 tons of water could be made per diem, and a considerable pressure of steam was required, which was objectionable, as the boilers were old, and no one could be found who knew anything about them. The alteration above described increased the output of water to about 70 tons and required only a very low pressure. It was never an economical condenser, 5½ tons of water only being made to a ton of coal; or 5½ pounds of fresh water per pound of coal; but on the other hand, having no auxiliary or driving engines, less supervision was required. The large consumption of coal was due entirely to the boilers being of very old pattern. This establishment and all the work done there was under the personal superintendence of Mr. Swinney, engineer of the Tamar, and I cannot speak too highly of his services there.

The Malta condenser was put together on the Arsenal jetty by Mr. Rigler, engineer of the Invincible. It requires careful watching and is fairly economical, seven tons of water being made with one ton of coal. Being quite complete in itself it would be most useful in any out-of-the-way place. It took about a week to remove it from the vessel that brought it and to get it erected and in working order. The arrangement for supply of the water was similar to that at the Arsenal Dock condenser. A vessel that had been originally chartered to take refugees to Malta, called the Maulkins Tower, being available, I had her surface condensers fitted for distilling water for issue, and placed her in a convenient position alongside a wharf near the native quarter. She has ballast tanks capable of holding over 300 tons of water. These were thoroughly cleaned and then filled with fresh water, which could be supplied by her pumps directly into tanks alongside. She was capable of distilling at least 70 tons of water per diem at a cost of a ton of coal for about 6½ to 7 tons of water. She was originally intended to supply the native population, but as they never felt the scarcity of water she was very useful in completing the transports and supplying the troops stationed at Meks. I made arrangements with His Highness the Khedive that his splendid yacht, the Mahroussa, should supply with her surface condensers all the water required at the palace, where a very large number of people (2,500) were constantly maintained. The yacht, with her numerous boilers, was capable of turning out 250 tons a day, but it was not intended to draw on her for the public unless required by urgent necessity. The sum of all these arrangements, it will be seen, provided for a supply of fresh water of 330 tons per diem, or nearly 70,000 gallons, without counting the Khedive's yacht. This would have fully met the requirements of the population estimated to be in Alexandria when the scarcity of water seemed imminent. Mr. Felix Foreman, chief engineer of the Bittern, was in charge of the whole work.

The Utilization of Smoke.

A company at Elk Rapids, Mich., which manufactures fifty tons of charcoal iron a day, formerly allowed the smoke made in burning the coal to go to waste. Now the smoke as it is formed is delivered into stills charged with lime and surrounded by cold water, the result of the condensation being, first, acetate of lime; second, alcohol; third, tar; the fourth part produces gas, which is consumed under the boilers. A thousand cords of wood are converted into charcoal daily, yielding 2,800,000 cubic feet of smoke, from which are obtained 12,000 pounds of acetate of lime, 200 gallons of alcohol, and 25 pounds of tar. The alcohol has been contracted to a firm in Buffalo, N. Y., the *Trade Review* says, for five years, they furnishing the packages and receiving it at the works at 80 cents per gallon.

The gases usually wasted when iron is produced with stone coal or coke are now, in some European establishments, made to give up the tar, ammonia, etc., which they contain. *Engineering* reports that this is effected at the Gartsherrie Works without disturbing the smelting process and without materially lessening the value of the gases for heating boilers and similar work. A similar process has lately been introduced in the coke trade of South Durham, and at some of the coking collieries of France, the waste gases being used in the production of commercial ammonia.

Boiler Explosion in Cincinnati.

If the press reports are true, the disastrous boiler explosion which occurred in the Forest City Iron Works, Cincinnati, Ohio, November 13, cannot properly be called an accident.

The boiler, 28 feet long and 4½ feet in diameter, stood in the center of a large brick building in which three hundred and fifty men were employed. The boiler was old, patched, and is said to have exploded once before.

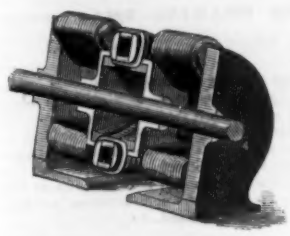
That such a boiler should be the occasion of a great disaster is less remarkable than that the number of killed should be limited to half a dozen and the wounded to perhaps a score. The building was wrecked, and fragments of iron work, masonry, and human bodies were scattered over a wide area. At long distances from the center of the explosion men were killed by such missiles.

Disasters of this character are not accidents; they are crimes. And owners of the building destroyed should be held to rigid responsibility.

RECENT INVENTIONS.

Dynamo Electric Machine.

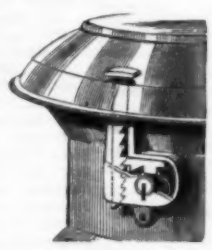
The object of the invention shown in the annexed engraving is to produce dynamo electric machines so constructed that the current induced in the armature will be without wide breaks, and nearly continuous. The invention has been patented by Mr. Henry B. Sheridan, of Cleveland, O.



The machine has field-magnets oblong in cross section and arranged in two series in a circle around the armature shaft, with the poles of the opposing series facing each other, and arranged a sufficient distance apart to receive the armature between them, the poles of each series nearly overlapping each other laterally and forming a nearly continuous magnetic field. With this arrangement the face of the pole of each magnet is arranged diagonally across the path of the armature ring, in the plane of its rotation. This brings the magnets into such positions that each section coil of the armature will pass upon the pole of each magnet at the instant it leaves the pole of the preceding magnet, so that the current induced in the armature will be nearly continuous.

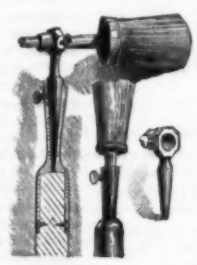
Milk Can Lock.

This invention is designed to prevent unauthorized persons from taking milk from the cans. The lock consists of a small, compact casing secured to the neck of the can and containing a socket for receiving a ratchet bar which is inserted through a hole in the can cover and pressed down into the lock casing, where the teeth of its ratchet are engaged by a spring pressed bolt. The can cannot be opened except by using the proper key to withdraw the spring bolt from the teeth of the ratchet bar. The engraving shows the construction of the lock and the manner of applying it to the can. This invention was recently patented by Mr. Seymour Horton 622 Sixth avenue, New York city.



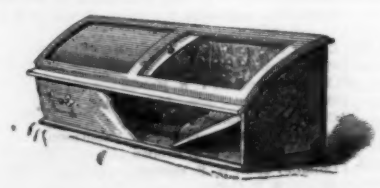
Extension Handle for Paint Brushes.

In painting surfaces, such as the roofs and outer walls of buildings, the painter often finds it convenient to use an extension handle to his brush, so that he can, while painting a horizontal surface, apply the paint while standing, or when painting a vertical surface extend the space over which he can apply the paint without moving his support. The engraving shows a cheap and efficient device for connecting brushes of various sizes to an extension handle, and is capable of holding the brush either in a vertical or horizontal position as may be desired. The device consists of a socket adapted to receive the brush handle in one end and the extension handle in the other. There is also a socket for receiving the brush handle, which is provided with a side shank adapted to the socket at the end of the extension handle. This useful invention has been patented by Mr. George W. Smith, of 81 Middagh St., Brooklyn, N. Y.



Improved Burial Casket.

This invention consists in a coffin or burial casket in which provision is made for raising or arranging in a more or less elevated position the head and upper portion of the dead body, and of adjusting its inclination, so as to give



the corpse a more natural and life-like position. The body may be laid on its side, and will have the appearance of reclining in an attitude of repose, as if on a couch or sofa, and may be readily viewed from a considerable distance. This invention has been patented by Mr. John J. Tickner, of Sand Beach, Mich.

M. ZENGER ("Ciel et Terre") maintains that the hurricanes of the West Indies and the typhoons of the Chinese Sea have a period of twelve days, equal to that of the rotation of the sun.

Explosion of an Accumulator.

An accident lately occurred at the Locan Shaft of the Eureka Consolidated Mining Company, Eureka, Nev., the accumulator of the new pumping machinery bursting into fragments and doing considerable damage to property, but injuring no one.

These pumping works are on the hydraulic system, now so successfully operating at the Combination Shaft, on the Comstock. The new machinery has only been in operation a couple of months and was working smoothly. It was started up and kept running some time under the personal supervision of Mr. Joseph Moore, Superintendent of the Risdon Iron Works, acknowledged to be one of the very best mechanics on the coast.

The explosion is a very curious one and deserves more than passing mention. As the mining community is interested in the hydraulic system of pumping, and as it may be thought that this accident is due to a fault of the system, a brief explanation will be necessary. Suppose the mine is 1,000 feet deep, and that the water is to be raised that distance. Upon the 1,000 feet level is erected a pair of hydraulic pumping engines, which receive their pressure water through supply pipes from the surface. By these two pumps the drain water is raised through the discharge column, and the water used in doing the pumping is sent back through the return pipe to the reservoir on the surface. On the surface is a cast iron accumulator partly filled with water, the remainder of the space being filled with air. This air is kept constantly at a certain pressure by means of plunger pumps, which in turn are operated by a steam engine. These pumps supply the accumulator with water and keep it on a pressure great enough to move the two underground pumps. This in brief is the principle.

It was this accumulator which exploded. The accumulator had been tested up to 2,000 pounds to the inch, but was only carrying 1,150 when it exploded. From the local paper, the Eureka *Sentinel*, we take the following concerning the disaster:

The accumulator burst about 30 feet below the cap, two sections of 10 feet each and the base below remaining intact. The theory is that the explosion took place at the line where the air and water met. About 20 feet of the accumulator went into pieces, varying in weight from some 1,800 pounds to an ounce or half ounce avoirdupois. The eastern portion of the works, as mentioned, was broken down and completely wrecked. Eight large missiles went through the building, the two principal of which through the south and east ends. The loss to the woodwork is estimated at $3,000. The cost to replace the part of the accumulator destroyed will be probably somewhat between $10,000 and $15,000. The total loss, to put everything back in smooth running order again, will not exceed, and will not be likely to reach $20,000.

The cause of the explosion is totally unaccountable; it is a mystery. Each separate section of the accumulator had been tested up to 2,000 pounds to the square inch. It had been run before for weeks at a time under a pressure varying from 1,150 to 1,200 pounds, and it has been subjected to a pressure of 1,400 pounds. At the time of the explosion the pressure was 1,030 pounds, according to the testimony of the engineer, Mr. Boston, who is a remarkably careful man, and his statement is doubtless correct, for there was no occasion for any greater pressure than was on. As mentioned, the point of explosion was in the second and third sections from the top, above the water line. This is evident from the fact that these were torn to pieces and hurled to great distances, while the four lower sections and the top section merely fell off, and were found near the base of the accumulator. What renders the explosion difficult to account for is that the material of which the accumulafor was manufactured was of the very best—cast out of 25 per cent steel and 75 per cent of the first quality of pig iron, the breaking strain of which mixture was 33,000 pounds to the square inch.

The fragments thrown off were found upon close inspection to be of the best quality, without defect or flaw anywhere. Tested with the chisel, the mixture cuts as wrought iron, and being struck with the hammer, leaves a smooth, polished impression. The only defective place discovered was near one of the flanges, and was not broken by the explosion, but the fall. This accumulator, according to relative pressure, is 25 per cent stronger than the one in use at the Combination Shaft on the Comstock, the latter being of iron entirely. This statement makes it clear that the explosion was caused by some unknown force, the agency of which is yet to be determined.—*Min. and Sci. Press.*

Mr. Stanley's Discoveries.

A correspondent of the London *Globe* who has interviewed Mr. H. M. Stanley, says that gentleman has had practically unlimited means at his command, through the generosity of the King of the Belgians, who, moreover, has been the main supporter of several of the so-called International African Expeditions; as Mr. Stanley puts it, he has been in a position to pay for every cubic inch of air he and his men breathed, and every square foot of ground they trod upon. The object of the King of the Belgians appears to have been entirely disinterested—simply to do what he could to render accessible to commerce and civilization, and thereby develop the resources of the great interior of Africa. For this purpose the Congo formed a splendid channel of communication, only unfortunately its lower course for many miles is obstructed by impassable cataracts. To surmount this obstruction has been the object of Mr. Stanley's work. He states that already he has carried a well made road, 15 feet wide on an average, from below the cataracts, 280 miles along the north bank of the river, far beyond Stanley Pool, and therefore well into the navigable upper waters. To assist him in this undertaking he has not only had native workers, but relays of young Europeans as superintendents; and for this work he finds Englishmen better than any others, and would be glad to have a fresh supply to send out. So substantially has this road been constructed, that it has stood the deluges of rain that break down upon it from the mountain sides, and has borne the heavy traffic which the transport of engineering plant to the upper reaches has rendered necessary. Causeways have been laid where necessary and bridges built, and the road has, by means of excavations, embankments of stone, and layers of earth, been carried right round the face of a mountain which comes sheer down to the river at one place. On rounding the mountain, Mr. Stanley states that the road enters an avenue of exquisite beauty and coolness which has been cleared through the forest. So thickly timbered is the country in some parts that thousands of trees have had to be felled, and their roots either grubbed up or leveled. At intervals along the road, stations have been planted, and already there is a regular service of couriers between the stations, and by them a growing trade is being established. As to what are the possibilities of commerce along this route, he states that during the progress of his work a million yards of Manchester goods have been distributed through the country in payment for labor and other services performed by the natives. One of the articles of transport along the new road was a fine steam launch, with which Mr. Stanley has done some good exploring work some 400 miles above Stanley Pool, quite 700 miles above the mouth of the river. When he feels at liberty to publish an account of his work (at present his first duty is to his employer, the King of the Belgians), it will be shown, the correspondent believes, that some first rate exploring work has been done. The launch, for example, was taken up a new river, opening from the south bank of the Congo, some distance above Stanley Pool, and which, it was found, led into a fine lake. The lake was covered with fishermen's canoes, whose occupants looked aghast at the snorting monster puffing out smoke, and fled in dismay. One, however, was caught, and after being soothed down and kindly treated, was sent off loaded with presents to his wondering fellows peering from among the bushes on the shore. In Mr. Stanley's opinion, the soil is capable of unlimited development for crops of all kinds, and, by judicious use, the supply of caoutchouc in the forests is inexhaustible. The greatest difficulty to the utilization of the river throughout its navigable length is the almost untamable cannibal tribes who inhabit the upper reaches between Stanley's furthest point and the neighborhood of Nyanginé.

The Longest Coil Spring in the World.

Probably the greatest feat in metal working ever performed, says the *American Manufacturer*, was that of the rolling of a steel strip six inches wide, one-quarter inch thick, and three hundred and ten feet long, at the Superior Mill, Alleghany, operated by the Messrs. A. C. and C. H. Kloman, of that city. This was performed at the first effort, and the product, coiled and tempered, was, on October 25, exhibited in the Penn Bicentennial parade, Philadelphia, and was much admired and wondered at by the masses there assembled. The Messrs. Kloman have contracted with the United States Spring Car Motor Construction Company, of Philadelphia, to furnish them with an unlimited number of these steel springs, which are designed to enter into the construction of their new car motor. The blooms, of 0·55 per cent carbon open hearth steel, were made by the Spang Steel and Iron Company, and measured six inches wide, four inches thick, and twenty-four feet long, weighing seventeen hundred pounds. They were heated in a special heating furnace thirty feet long, built for this purpose, and the blooms were in one operation rolled down to one-half inch in thickness and one hundred and fifty long. This strip was then taken back to the heating furnace and by successive heating and rolling operations, involving the use of the hydraulic attachment to the Kloman universal mill, was reduced in sections of thirty feet of the one half inch strip to one-quarter inch in thickness, and thus in five reheating and rerolling operations was finally rolled out to the desired length and thickness. It was then taken back to the furnace, and slowly drawn through the same and wound on a four-foot drum, thus putting it in shape for shipment on a railroad car.

Local Intensification during Development.

A plan I have adopted during the development of interiors, and which is equally useful for bringing out the dark shadows of trees, etc., will be acceptable to many, especially to those who invariably under-expose their plates.

While allowing the developer to act, take a solution of ammonia a little stronger than the latter, and, with a brush steeped in this, apply it to the undeveloped portions of the plate, keeping the brush in motion and freshening it with more and stronger ammonia as required. This will frequently bring out details which, under ordinary circumstances, would be lost. The body of the developer prevents the formation of hard lines by diffusing the strength of ammonia. The same principle can be applied to an over-exposed plate, using pyro instead of ammonia.—*J. H. T. Ellerbeck, in British Journal of Photography.*

ENGINEERING INVENTIONS.

Mr. Lewis Larchar, of Marble Rock, Ia., has patented an improvement in snow plows which consists of top, middle side, and rear side wings in addition to the ordinary front scrapers; also, top chutes back of the front scraper for more effectually throwing off such portions of the snow as fall of being thrown off by the main scrapers, also such as are thrown over and fall back behind the main scrapers.

An improvement in log chutes has been patented by Mr. William Henry Barnum, of Reno, Nev. This improvement relates to chutes for moving saw logs. As usually constructed, they consist of bare poles which have to be kept well greased in order that the logs may be moved. This greasing is expensive, especially when the chute is extended a long distance, and the labor of keeping the chutes in proper condition is an additional expense. This invention consists in the combination of rollers with the ways of the chutes.

An improved interlocking bolt has been patented by Mr. Thomas J. Bush, of Lexington, Ky. These interlocking bolts are adapted to bolt two or more blocks, planks, or pieces of wood, stone, or metal, together, or to secure any object to or upon another, without the holes in which the bolts are placed being made entirely through to the surface opposite to that against which the nuts or bars are screwed upon the bolts, the bolts being formed without heads, and used with only one bar or nut.

An improved balanced slide valve has been patented by Mr. Clarence E. Biddison, of Rock Island, Ill. This invention consists in the combination of a slide valve having opposite partially cylindrical end portions or bonnets constructed to form receiving spaces for the exhaust steam, and a valve chest divided by the valve to form a central exhaust steam chamber and outer end live steam chambers, and sliding packing plates applied to the bonnets, whereby the valve is partially relieved from pressure bearing it down on its seat, and is exposed to equal end pressures.

MECHANICAL INVENTIONS.

An improved stump puller has been patented by Mr. Newton P. Merchant, of Blaine, Mich. The invention consists in a frame carying wheels, shafts, and levers for pulling stumps, the frame being mounted on an axle and on a runner.

Mr. John D. William, of Rising Sun, Ind., has patented an improvement in bell striking mechanism specially adapted for clocks, and it is designed to cause the striking of a bell capable of being heard miles distant by the action of a clock of small size.

Mr. John Wilber, of Gleason, Pa., has patented an improved churn power in which weights and springs are employed; and it consists in the peculiar construction and arrangement of gearing and levers by which the power given out by the falling weight or unwinding spring is utilized to the best advantage.

Mr. Thomas Donahue, of Terryville, Conn., has patented an improved padlock. This invention consists in certain novel features of construction in the class of locks known as the pin padlocks, the object being to obtain strength and durability.

An improved elastic packing for spinning spindle bolsters has been patented by Mr. Albert R. Sherman, of Pawtucket, R. I. The object of this invention is to prevent the vibration of the spindle and permit it, when revolving, to adjust itself to its true center of gravity; and to provide a more elastic and durable packing than the wool packing commonly in use, the latter being liable to become charred or burned by the friction of the spindle in the bolster.

An improved cotton elevator has been patented by Mr Jordan F. Jones, of Laurel, N. C. This invention relates more particularly to elevators for lifting seed cotton in gin houses to the different floors; and it consists in the construction and combination of devices whereby the cotton may be taken from a wagon while on a pair of scales which weighs it, and be very expeditiously transferred, free from bocks and packing, on to any one or more of the upper floors of the gin house.

An improved roller bush has been patented by Mr. Patrick Brownley, of St. John, New Brunswick, Canada. This roller bush is formed of a cup-shaped casing containing a series of anti-friction rollers, which are held in the casing by a screw ring screwed into a threaded opening in the cup-shaped casing, which ring is held from unscrewing by tap screws passed into the outer edge of the ring and the inner edge of the casing The axle pintle or pivot is passed through the circular space between the rollers, against which rollers it rests

A novel index for watch regulators has been patented by Mr. Ferdinand A. Curpen, of Upper Sandusky, O. The object of this invention is to provide for the convenient and precise adjustment of the index hand of watch regulators. Heretofore the index plates have been marked with an arbitrary scale, which is not reliable on account of difference in watches, even in those of the same grade. To obviate the difficulty from such variations this inventor provides indexes specially arranged for each watch, the construction being such that the changes can be readily made.

A machine for planing locomotive links and link blocks, has been patented by Messrs. Ernest Cockfield and John Howe, of St. Joseph, Mo. The invention consists of a combination of devices capable of attachment to an ordinary metal planer, whereby reciprocating motion of the planer table is made to impart a circular or curved motion to the holder that carries the link or block to be planed. This is accomplished by means of a connecting rod and a sliding quadrant lever, arranged for operation between the holder or rocking plate on which the link or link block is carried and the planer bed.

Mr John H. Ferguson, of Dayton, Tenn., has patented an improved dump cart having a third wheel located between the shafts to carry the weight commonly supported on the back of the horse by the shafts, and contrived with hitching devices at the rear by which to hitch on the horse so as to draw the loaded cart backward to the dumping place, together with hitching devices at the front end for hitching thereat after the cart is dumped to draw it forward to the loading place, and thus avoid the turning of the cart at both ends of the route, effecting considerable economy of labor, besides saving the deep cross ruts formed in the roadway by turning the carts, especially at the dumping place.

Mr. Patrick Slattery, of Charleston, S. C., has patented a baling press constructed with a frame, a head block, and a follower, with the ends of which are connected by clevises the upper ends of screws. Upon the screws are placed beveled gear wheels having threads in the inner surfaces of their hubs, and meshing into gear wheels operated by cranks and pivoted to sleeves placed upon the screws. The gear wheels and sleeves are held from moving up and down by blocks secured to the press frame.

AGRICULTURAL INVENTIONS.

Mr. Martin McNitt, of Washington, Kan., has patented a combined harrow and corn planter. The improvement consists in various details which render the implement very easily managed and efficient.

An improved seed dropping attachment for check row corn planters has been patented by Messrs. Louis P. McGonigle and James H. Bigham, of Cato, Kan. This seed dropping attachment for planting corn in check rows has a spoke drive wheel, beveled gears, and a finger chain for tripping the seed valve. It will plant a field accurately in check rows.

Mr. Charles Scafe, of Bangor, Wis., has patented a hay loader which consists of a simple and efficient arrangement of guides, revolving rakes, and an adjustable inclined carrier upon a two wheeled hay rake, for attachment to the hind end of a wagon, to gather up the hay as the wagon and loader pass along over it and deliver it upon the end of the wagon to the attendant.

An improved sulky plow has been patented by Mr. Axel F. Bergqvist, of Fairfield, Ia. This invention relates to improvements upon the plow covered by Letters Patent, No. 234,743. November 23, 1880, granted to the same inventor, and it consists in certain novel features in the construction of the axle; and, in the combination with the lever for raising the plow out of the ground, of a spring adapted to assist the plow man when using the lever for this purpose; and various other improvements designed to increase the efficiency of the implement.

An improvement in sulky plows has been patented by Mr. Thomas T. Harrison, of Aubrey, Kan. This improvement in sulky plows consists of a joint in the tongue a little in advance of the axle on which the wheels are mounted, and about where the evener is attached, for allowing the tongue to swing, so that the horses may get about half way around square corners before the plow turns, together with stops by which the movement of the tongue on said pivot is limited to the required amount, the stops being changeable for allowing the tongue to be shifted in like manner on the pivot, either to the right or left hand.

Mr. John J. Morris, of Humboldt, Neb., has patented an improvement in cultivators designed for cultivating corn planted in what is known as the "listing process," which consists of plowing a wide furrow with a double mould board plow, subsoiling the furrow, and planting the corn in the furrow of ten or twelve inches deep. The improvement cultivator is divided along the middle longitudinally, and jointed together, so as to allow the sides to rise at an angle of sixty to eighty degrees, according to the inclinations of the sides of the furrows, in which the corn is planted, so that the teeth will straddle the corn and pulverize the sides of the furrows, and provided with a chain for connecting and holding the parts at the angle required.

MISCELLANEOUS INVENTIONS.

Mr. William C. Squier, of Kinmundy, Ill., has patented an eye wash consisting of the sulphate of zinc, oil of wintergreen, laudanum, oil of sassafras, sugar, and soft water.

A novel climbing device has been patented by Mr. Anthony Ward, of Brooklyn, N. Y. This is a novel and simple device for climbing chains. It is applied to the foot and leg in the same manner as telegraph pole climbers.

An improved car coupling has been patented by Mr. William J. Dawson, of Lawrence, Kan. This is an ingenious automatic coupler applied to the ordinary drawhead and capable of coupling cars of varying height.

A novel ribbon and lace show cabinet has been patented by Mr. Lucien P. Lowry, of Aurora, Tex. This invention consists of a revolving reel carrying rolls of ribbon. The reel is placed in a case with glass sides and the various rolls of ribbon are brought in sight by turning the reel.

Mr. Johann T. Stoll, of Sacramento City, Cal., has patented a buckle for harness, which is efficient, ornamental, and cheap, and will not catch or retain the hair of the horse's tail. The tongue of the buckle is pivoted to the bar and provided with angular upward bend at the free end.

Mr. Joseph A. Widemann, of Basle, Switzerland, has patented a new spring for mattresses, upholstery, etc., which is of simple construction and is strong and durable. It is a one-piece middle coiled wire spring having both ends formed into rectangular or nearly rectangular frames by which they may be applied between the top and bottom slats.

Mr. James C. Titzel, of Allegheny, Pa., has patented a process treating vulcanized India-rubber for the production therefrom of a pure rubber, consisting in dissolving the rubber in turpentine and linseed oil, then adding sulphuric acid and washing, then adding caustic potash, then precipitating from the soapy mass the pure rubber.

A simple and inexpensive apparatus for illustrating the rotation of the earth on its axis and around the sun, the changes of day and night and the seasons, and other phenomena connected with the movement of the earth in its path through the heavens, in a manner that can be clearly understood by youngest pupils, has been patented by Mr. John R. McCrery, Jr., of Sulphur Lick, Ky.

An improved device for holding spectacles in front of the eyes or for holding them when not in use, has been patented by Mr. Joseph A. Shone, of Salem, Miss. The invention consists in a hat rim or shade provided on the under side with hooks for holding the bows and lens frames of spectacles, whereby the spectacles can be held to the under side of the shade when not in use, or can be lowered upon the nose when they are to be used.

An improved saddle girth has been patented by Mr. Calvin Williams, of Big Valley, Texas. The advantage of this invention is that as the pad rests on the horse's belly at the usual point occupied by the ordinary girth, and the fastening straps radiate therefrom and connect with four different points near the front and rear of the saddle, the four straps embrace the rotundity of the horse's belly, and thus prevent the saddle from slipping.

An improved organ case has been patented by Mr. Andrew Anderson, of Moline, Ill. This invention relates to the pedals of organs, and is designed for the prevention of injury to the bellows, sounding board, key pins, reed cells, or other parts of the interior of the instrument by the ingress of mice or other vermin, without affecting or injuring the sound or quality of tone of the instrument, and by means which add little or nothing to the cost of it, and are applicable to organs and other like instruments as now constructed.

Mr. Cyrus R. Furey, of Logansport, Ind., has patented a device for connecting the pole strap to the breast strap; the improvement consists in a contrivance of the slide by which the connection is fitted on the breast strap, calculated to render it more durable of itself and less wearing to the strap, also to retain it better in its proper position on the breast strap when hanging by one hook, also to facilitate the connection of the martingale.

Mr. James Camper, of Saguache, Col., has patented an improvement in that class of spittoon holders in which the spittoon is inclosed in a box or case provided with a hinged lid and means for opening and closing it. The invention consists in the combination, with a spittoon box or case having a hinged lid, of a plate or arm attached to said lid and a vertical rod working in a tube or hollow standard attached to the box or case, and provided at its lower end with a lateral fork for engagement with the plate or arm.

An improvement in steam generators has been patented by Mr. Harrison Willis, of Brooklyn, N. Y. This invention relates to the class of boilers known as "coil boilers;" and it consists essentially in the combination with a coil, of a central pipe arranged to receive the steam and superheat it, the said pipe being fixed at its upper end and free to move at its lower end when expanded or contracted by variations of temperature, the valve and damper connections are controlled and operated by the expansion and contraction of the pipe.

Mr. John H. Seabury, of Hempstead, N. Y., has patented an improvement in faucets, constructed to discharge from the same nozzle either hot or cold water or other fluid, and it embraces a combination, with the barrel of the faucet having a taper seat and elongated or enlarged general delivery opening, the nozzle of the faucet, and hot and cold water inlets, of a taper plug provided with transverse passages through it for supplying either hot or cold water at different periods, or both hot and cold water at the same time, by simply turning the plug into different positions.

Mr. Artemas L. Dawson, of Elk Point, Dakota Ter., has patented an improvement in lamps. As usually constructed, lamp bodies or reservoirs are provided with a vertical rim or neck around the opening, and metal collars are secured thereon by means of plaster of Paris or other cement. Such neck increases the difficulty and cost of casting or moulding the lamp body, and the collars are liable to become loose and detached in consequence of the cement shrinking and falling out. To obviate these defects, the inventor combines with a neckless lamp body a metal collar and elastic packing, the latter two being turned over the edge of the lamp body so as to inclose it between them.

A new stirrup which can be used as a spur has been patented by Mr. Charles E. D. Parker, of Milan, Kan. The stirrup has a wire or strip pivoted to the inner shank, the lower end of this strip or wire being provided with prongs and the upper end being bent or inclined and passing into the stirrup loop, whereby when the stirrup is pressed against the side of the animal and the inner side is raised the upper end of the pivoted wire or strip will be depressed by the stirrup loop, and the prongs will be forced out of the guard frame at the side of the stirrup and can be used to speed the animal.

An improved tuyere has been patented by Mr William H. H. Sheets, of Pittsburg, Pa. The invention consists essentially in providing a doubled walled tuyere with one or more double spiral channels or passages between the walls, said channels being formed by spiral partitions, commencing at the butt of the tuyere, diametrically opposite each other, and communicating with each other at the nose of the tuyere, through which channels a stream or body of water is kept in constant and rapid circulation from the butt to the nose, and then back to the butt and out through a waste pipe, whereby the nose and entire body of the tuyere is kept at a comparatively low temperature.

Mr. Edmond L. M. Brochon, of Milan, Italy, has patented a process for extracting glycerine and salts from waters obtained in the manufacture of soap, which consists, first, in treating the cold waters with chloride of sodium, filtering, applying hydrochloric or sulphuric acid, and precipitating the insoluble matter with any of the well known coagulating agents, next heating to ebullition the clear liquid and adding milk of lime, then treating with bicarbonate of soda or potash, and applying hydrochloric acid.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

Letters Patent of the United States were Granted in the Week Ending

November 14, 1882,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A printed copy of the specification and drawing of any patent in the annexed list, also of any patent issued since 1866, will be furnished from this office for 25 cents. In ordering please state the number and date of the patent desired and remit to Munn & Co., 361 Broadway, corner of Warren Street, New York city. We also furnish copies of patents granted prior to 1866; but at increased cost, as the specifications, not being printed, must be copied by hand.

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English Patents Issued to Americans.

From October 20, 1882, to October 27, 1882, inclusive.

"Cosmic," B. Arents, New Britain, Conn.
Cards, playing, B. Dreyfuss, New York city.
Electric light, F. Vanchoate, New York city.
Elevator, pneumatic, C. A. Needham, New York city.
Friction clutch, D. Frisbie, New Haven, Conn.
Governor, steam, F. D. Cumnver, Detroit, Mich.
Iron ore, reduction of, L. Durand *et al.*, New York city.
Motor, G. D. Garvie *et al.*, New York city.
Pig metal, casting, G. A. Leishman, Pittsburg, Pa.
Ratchet wrench, G. W. Hight *et al.*, Nasnville, Tenn.
Razor blades, J. D. Frary, Bridgeport, Conn.
Sewing machines, Morley Sewing Machine Company, Boston, Mass.
Sewing machines, L. W. Miller *et al.*, Elizabeth, N. J.
Stench trap, C. Lightbody, Brooklyn, N. Y.
Tramway, rope, A. S. Hallidie, San Francisco, Cal.
Vise, H. F. Read, New York city.
Watches, J. W. Bell, Conowingo, Md.
Water purifier, D. Hanna, Ogdensburgh, N. Y.

NEW BOOKS AND PUBLICATIONS.

HYGIENIC AND SANATIVE MEASURES FOR CHRONIC CATARRHAL INFLAMMATION OF THE NOSE, THROAT, AND EARS. By Thos. F. Rumbold, M.D. St. Louis: Medical Journal Publishing Company. 1882.

The first edition of this work was favorably noticed about a year ago. The author is more than ever confident that the most successful method of eradicating catarrhal inflammation of the respiratory organs is through the enforcement of proper hygienic and sanative measures; this especially with the young.

TREATISE ON THE METALLURGY OF IRON. By H. Bauerman. No 176, Weale's Rudimentary Series. London: Crosby, Lockwood & Company.

The improvements in this, the fifth edition of Mr. Bauerman's well known treatise are found in a revision of the chemical notation; considerable additions to the chapters on steel making to cover the more important recent advances in the art; and some valuable new matter with respect to the hematite deposits of Spain and North Africa, the oolitic ores of Luxemburg and Lorraine, and the more important ore deposits of America and India.

DRESS AND CARE OF THE FEET. By Prof. Peter Kohler. G. P. Putnam's Sons, New York.

This is a very short treatise on a very important subject to most persons The venerable author has treated the feet of some of New York's most distinguished citizens for a quarter of a century, and at the end of his volume he prints the names and addresses of his patrons.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at this office. Price 10 cents each.

Correspondents sending samples of minerals, etc., for examination, should be careful to distinctly mark or label their specimens so as to avoid error in their identification.

(1) A. F. W. asks: Will you inform us what is the active substance used in the so-called bleaching powders (used for bleaching hair, etc.)? Is it sulphide of barium? Also please explain its action. A. It is the peroxide of barium, to be bought in bulk in the market, and contains a large proportion of loosely combined oxygen gas, which in the peroxide of hydrogen produced has the powerful bleaching action.

(2) G. C. W. asks: 1. What size propeller must I have to run a skiff 15½ feet long by 3½ feet beam, to make six to seven miles per hour? A. 18 inches diameter and 2½ feet pitch. 2 How many revolutions should the propeller make per minute? A. 300 to 350. 3. Is a two or four bladed propeller best? A. Two bladed. 4. What should the weight be of it? A. About 70 or 80 pounds.

(3) C. W. G. writes: I recently bought a lot of books at auction that are very badly stamped with blue ink which greatly disfigures them; can you give me a recipe that will remove the blue ink without disfiguring the paper? A. Try a little peroxide of hydrogen solution, and if this fails, diluted hydrochloric acid, 1 part acid to 7 of water.

(4) E. E. P. asks: 1. Where can I obtain Dr. Henry Draper's paper on silvered glass specula? A. Draper's Method of Silvering Specula, SCIENTIFIC AMERICAN SUPPLEMENT 105. SUPPLEMENT 121 has several other methods. 2. How large should the small speculum of a telescope of the Newtonian form of 8¾ inches aperture and 80 inches focal length be, and in what position should it be placed, its shape being oval? A. The size of a small speculum for a Newtonian form of telescope should be one-fifth larger in its lesser diameter than the field glass of your lowest eye piece, and should be an ellipse of the proportions of a cylinder cut at 45°, and may be placed in the optical axis of the telescope for the best effect, although they have been placed in all positions between the center and edge of the tube, with the eye pieces at other positions than at right angles to the tubes, as well as being dispensed with, as in the Herschelian and Ross form with their accompanying distortion of image and increase of light.

(5) T. H. J. asks for directions for softening or annealing steel sufficiently to admit of cutting letters on the face of block by hand. A. For annealing steel for cutting with a graver by the water process, heat the steel to a full red, let it cool slowly in dry lime or fine ashes until it is black, then dip in water.

(6) G. G. G. asks how bort and carbonado are attached to drills, and how the drills are worked to prevent fracture of the brittle minerals? A. The setting of bort or carbons in drills is done by boring holes in the iron, where the bort or carbon is required to be placed, and cutting the sides of the holes with small chisels or gravers of the proper shape to receive it to the depth sufficient to allow of the adjoining metal being driven up against the bort with small sets or chasing tools, so as to partially inclose it with a firm metallic border, leaving the carbon projecting just above the surrounding surface. Such drills must be handled very carefully and should never be dropped upon the bottom of the bore. The drills are generally made hollow, or of iron tubing with the carbons set on the outer and inner edge, so as to make a cut that will clear the tube and take out a solid core of rock in the center. They are revolved quickly with light feed, and cleared with a stream of water down the center.

(7) J. S. G. asks: 1. Is it unhealthy to use pulverized borax in washing the hands and face, say several times a day, for years? It is better and cleaner than soap. A. Borax is an excellent detergent and harmless to the skin, even if used as often as you mention. 2. Are cockroaches not useful from a sanitary point of the question? I know they are disagreeable to have around. A. Cockroaches are probably excellent for removing the filth that brings them to a locality.

(8) L. R. S. asks how to remove paint spots from a rubber coat? A. Try some aqua ammonia, or if this will not answer, spirits of turpentine rubbed on with a rag.

(9) C. S. asks: Can you give form of furnace and process for annealing gray iron casting? A. Gray iron work is annealed by packing in iron boxes (cast or wrought) with lime and charcoal, pulverized coke mixed with fine ashes. In fact, any material that does not melt will exclude air or prevent oxidation. Furnaces are made similar to the reverberatory furnace for ores and iron or a peddler's furnace. Heat only to a cherry red, and continue from one to three hours according to requirements.

(10) E. T. L. asks how the gloss can be brought back on a marble slab upon which some wine has been spilled? A. Repolish the spots or parts of the slab on which the polish has been destroyed with oxide of tin and water, by rubbing with a rag or cushion of cloth. Use the oxide of tin, or putty powder as the marble polishers call it, about as thick as cream.

(11) C. P. asks how to put drill and cotton in oil to make them like those sailors' yellow suits and the black horse covers? What kind of paint do you use, and how to fix the oil? A. The materials are first sized and then dipped into oil which has been mixed with yellow ocher for yellow, or fine lamp black for black; only a little color is required. The oil is fixed by drying. Sometimes a little patent drier is used with it.

(12) J. A. F. writes: 1. Wishing to set a pair of return tubular boilers 39" x 14', what height should we have boiler above grates? A. Set the boilers 18 inches above the grate. 2. What size stack? A. Area of chimney or stack, 5 square feet. 3. Where should the bridge wall be, and how close to boilers? A. Bridge wall at back of grate, 6 inches clear from boiler. 4. Should it be filled with dirt back of bridge? A. Do not fill in back of bridge wall. The chamber gathers the heavy ashes, and prevents excessive accumulation in fines. 5. What size of safety valve, either lever or pop valves, should we use? A. Three-inch safety valve of the lever kind. 6. Should we have gauge cocks on one or both boilers? Fuel to be used, hard wood sawdust, with some four-foot slabs? A. Put gauge cocks and water gauges upon both boilers.

(13) W. F. H. says: Please explain the mystery of a horse hair; why it assumes life when kept under water? A. It does not assume life. The horse hair snake, so called, is a worm which is a parasite of crickets and grasshoppers during most of its life.

(14) G. L. G. asks: I would like to know how to boil meerschaum pipe in wax to make it color. What kind of wax and how long to boil it, as well as degree of heat required? A. This is an art that requires considerable skill and is performed as follows: A water bath is filled with pure beeswax in small pieces, and this carefully melted, when the pipe or other article is immersed in it and boiled for from twenty-five minutes to half an hour, when it is removed, the adhering wax wiped off, and the work is finished. The wax must be absolutely pure and is very difficult to find in the market.

(15) G. F. N. asks as to the difference, if any, between carbolic acid and phenic acid: the color in the latter and a seemingly slight difference in the odor of the two acids make me think they are not the same. A. There is no difference between them.

(16) X. Y. Z. inquires: What is the substance called "foliated graphite"? It was mentioned to me as being good for packing stuffing boxes. A. Foliated graphite is the flaky form of pumbago and may be readily bought as such from any wholesale druggist.

(17) C. H. writes: A friend of mine says a planet is a star, and twinkles. I say that a planet is no star, and does not twinkle. Please inform me who is right? A. Planets are not stars. Their light is steadier than that of the stars; but under some conditions of the atmosphere they twinkle.

(18) E. P. C. writes: On page 4,976, of SCIENTIFIC AMERICAN SUPPLEMENT 312, the author of an article on Electric Light Apparatus states, that "the troughs" (for the battery) "are made of mahogany, put together with brass screws, and well saturated with an insulating compound which also makes them acid proof." Will you please tell me through your notes and queries column of a suitable insulating compound, and the method of applying it? Would paraffine do? A. Yes.

(19) J. H. P. writes: During spring and berry time robins were very numerous, but for many weeks I have not heard or seen one, yet almost always just as winter sets in, or after the first snowfall, they appear again and are often seen eating frozen apples and mountain ash berries. Where do they spend the long fall vacation? A. Robins are abundant in spring, going north. Those that stop to breed scatter, but do not go far from their breeding places. The fall abundance is due to their massing for migration, the flocks being re-enforced by migrants from the north.

(20) J. L. H. asks: What is the right width amidships and depth forward and aft for a tug boat 56 feet long over all? Also right dimensions of an upright boiler, number and size of tubes, thickness of iron boiler plate and boiler heads. Dimensions of fire box. Also diameter and length of engine cylinder required to drive boat 12 knots per hour. Also diameter and pitch of propeller and number of blades. And diameter of iron shaft? A. 56 feet on water line by 13½, or 13 feet beam by 5 feet 9 inches hold. Engine, 12 x 12 inches. Vertical tubular boiler, 5½ feet diameter, 7 feet 8 inches high, with 150 2-inch tubes. Propeller, 5 feet diameter and 7¾ feet pitch; 4 blades. Shaft, 4½ inches diameter

(21) B. F. B. asks: Is it more economical to heat a private residence with steam than by hot air? If so, is it a better heat and more conducive to health than hot air? What are the objections to steam for the purpose of heating private residences by steam heaters? What proportion of private residences in your city are heated by steam heaters to hot air furnaces? I have heard it said that a large proportion of dwellings in the Eastern cities are heated by steam heaters. Is this so? A. It is more economical to heat small houses with hot air furnaces, provided they are of the best kind. There is no economy in purchasing small, cheap heaters Steam apparatus is considered the most healthy, because there is less liability to vitiation of the air by escaping gas, but there is no reason why a well made furnace should not be perfectly healthy. Thousands of private residences in the Eastern and Middle States are heated by steam apparatus with perfect satisfaction and safety the pressure in the boilers being only from one-half to five pounds, seldom beyond ten pounds.

(22) J. B. & B. write: We have put in our store recently some show windows; in the inside we have during the evening lamps burning. In order to let the steam out we have bored six holes in the sash, and yet the steam settles on the window as ever. What is the cause of that? A. The condensation is due to warmth inside of the window. In order to prevent condensation, the air space between the outside and inside windows must be kept cool so that the air inside will have about the same temperature as the air outside. By arranging holes of sufficient size top and bottom, you can secure a sufficiently cool temperature to keep the glass always clear.

(23) C. T. S. asks: What is the best way to build an ice house, and which is the best way to pack ice? A. The usual way of building ice houses is to put up a rough frame, so as to make the inside and outside boarding six, eight, or ten inches apart, according to the location and size of house; the thicker the better. Fill in with hay and pack close as the frame is boarded up. The roof should also be double. If the soil is porous or the position such that the floor can be drained, it is sometimes found economical to sink the house below the level of the ground several feet, and bank around with the dirt thrown out of the cellar. In packing the ice, hay, and preferably sawdust if it can be obtained, are used. The main point is to exclude air and heat; keep a thickness of one foot of packing all around next the sides. Batten the outside boarding, or if you can afford it cover the outside of the frame with tar paper or felt.

(24) S. T. M. asks: How are type writer ribbons made? What composition is used? A. The ribbons are moistened with aniline colors dissolved in glycerine.

COMMUNICATIONS RECEIVED.

How to preserve a safe and its contents from fire and burglary, by G. P. H.

Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

There are forty-four places called Milton in the United States, but only one pen called Esterbrook's Falcon No. 048. It can be procured from all stationers and booksellers.

Andrews' Complete Wood Worker, illustrated and described on another page of this number of the SCIENTIFIC AMERICAN, is for sale. Will take in capital or arrange for the manufacture. For full information address the invertor, R. H. Andrews, U. S. Treasury, Washington, D. C.

For Sale.—SCIENTIFIC AMERICAN, forty back volumes, cheap. For particulars address Ira F. Wilson, Austin, Ill.

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Lehigh Emery Wheels rank first for quality, safety, and durability. Compare them with any other make, and if you do not find them better and cheaper we will bear the expense of the trial. Lehigh Valley Emery Wheel Co., Lehighton, Pa.

Wanted.—Patented articles or machinery to make and introduce. Gaynor & Fitzgerald, New Haven, Conn.

Solid Cotton Belting, all widths, in lengths to suit. Greene, Tweed & Co., 118 Chambers St., New York.

To stop leaks in Boiler Tubes use Quinn's Patent Ferrules. Address S. M. Co., So. Newmarket, N. H.

Woodworking M'ch'y. Bentel, Margedant & Co., p. 350.

Latest Improved Diamond Drills. Send for circular to M. C. Bullock Mfg. Co., 80 to 88 Market St., Chicago, Ill.

Steam Hammers, Improved Hydraulic Jacks, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

Diamond Tools. J. Dickinson, 64 Nassau St., N. Y.

The Berryman Feed Water Heater and Purifier and Feed Pump. I. B. Davis' Patent. See illus. adv., p. 350.

50,000 Emerson's Hand Book of Saws. New Edition. Free. Address Emerson, Smith & Co., Beaver Falls, Pa.

For Pat. Safety Elevators, Hoisting Engines, Friction Clutch Pulleys, Cut-off Coupling, see Frisbie's ad. p. 349.

Gould & Eberhardt's Machinists' Tools. See adv., p. 350.

For Heavy Punches, etc., see illustrated advertisement of Hilles & Jones, on page 350.

Barrel, Key, Hogshead, Stave Mach'y. See adv. p. 350.

Excelsior Metallic and Steel Tapes, the best article made. General Depot, Keuffel & Esser, New York.

Magic Lanterns and Stereopticons of all kinds and prices. Views illustrating every subject for public exhibitions, Sunday schools, colleges, and home entertainment. 116 page illustrated catalogue free. McAllister, Manufacturing Optician, 49 Nassau St., New York.

Hand and Power Bolt Cutters, Screw Plates, Taps in great variety. The Pratt & Whitney Co., Hartford, Ct.

Mineral Lands Prospected, Artesian Wells Bored, by Pa. Diamond Drill Co. Box 423, Pottsville, Pa. See p. 350.

C. B. Rogers & Co., Norwich, Conn., Wood Working Machinery of every kind. See adv., page 350.

For best low price Planer and Matcher, and latest improved Sash, Door, and Blind Machinery, Send for catalogue to Rowley & Hermance, Williamsport, Pa.

The only economical and practical Gas Engine in the market is the new "Otto" Silent, built by Schleicher, Schumm & Co., Philadelphia, Pa. Send for circular.

The Porter-Allen High Speed Steam Engine. Southwork Foundry & Mach. Co., 430 Washington Ave., Phil. Pa.

4 to 40 H. P. Steam Engines. See adv. p. 350.

Wanted.—Four miles second-hand T-rail for tramway. Weight about 30 pounds to yard. G. Gunby Jordan, Columbus, Ga.

To make Violins, write James Robles, Syracuse, N. Y.

Water purified for all purposes, from household supplies to those of largest cities, by the improved filters manufactured by the Newark Filtering Co., 177 Commerce St., Newark, N. J.

Drop Forgings. Billings & Spencer Co. See adv., p. 333

Assays and Analyses of ores and all commercial products. Advice given and investigations made in all branches of chemical industry. Send for circular. N. Y. Assay Laboratory, 40 Broadway, New York.

Rolled and Cast Nickel Anodes, Nickel Salts, all Polishers' Supplies. Greene, Tweed & Co., New York.

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Lubricator. See advt., Detroit Lubricator Co., p. 318.

Bostwick's Giant Riding Saw Machine, adv., page 318.

See New American File Co.'s Advertisement, p. 318.

Steam Pumps. See adv. Smith, Vaile & Co., p. 316.

The Sweetland Chuck. See illus. adv., p. 318.

Knives for Woodworking Machinery, Bookbinders, and Paper Mills. Taylor, Stiles & Co., Riegelsville, N. J.

Woodwork'g Mach'y. Rollstone Mach. Co. Adv., p. 302.

Sheet and cast brass goods, experimental tools, and fine machinery. Estimates given when models are furnished. H. C. Goodrich, 66 to 72 Ogden Place, Chicago.

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Engines, 10 to 50 horse power, complete, with governor, $250 to $550. Satisfaction guaranteed. Nearly seven hundred in use. For circular address Heald & Morris (Drawer 127), Baldwinsville, N. Y.

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Jas. F. Hotchkiss, 84 John St., N. Y.: Send me your *free* book entitled "How to Keep Boilers Clean," containing useful information for steam users & engineers. (Forward above by postal or letter; mention this paper.)

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For Power & Economy, Alcott's Turbine, Mt. Holly, N. J.

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Split Pulleys at low prices, and of same strength and appearance as Whole Pulleys. Yocom & Son's Shafting Works, Drinker St., Philadelphia, Pa.

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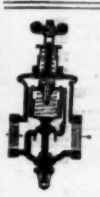

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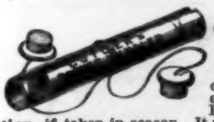

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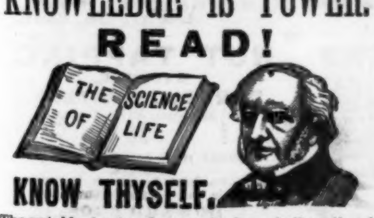

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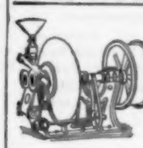

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BEATTY'S ORGANS, 27 stops, $125. Pianos, $297.50. Factory running day & night. Catalogue free. Address **Daniel F. Beatty, Washington, N.J.**

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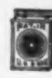

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